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Comparative Accuracy of Comparator Indicators With Soap Solutions

By HUGH H. MOSHER

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So much has been written about pH and hydrogen ion control in mill operations during the past few years that most textile chemists and even alert mill superintendents have given the matter study and have at least a bowing acquaintance with the term and its significance.

We have learned how pH control has almost revolutionized certain industries, eliminated many of the arbitrary empiricisms in others and freed still others from many of the perplexing quality vicissitudes experienced from time to time.

The relation and importance of the pH factor to chemical textile processes, however, does not appear to have been recognized or appreciated by even textile chemists until the past few years, but enough work has now been accomplished to indicate that in practically every liquid process, to which textiles are submitted, the hydrogen ion concentration is a factor of definite practical, and in many cases, vital importance; that some optimum pH exists producing at that point either a maximum or minimum of adsorption of some chemical or dyestuff from solution by the fiber being treated. As a natural corollary, it has been shown that those mills which by means of chemical control, experience or good fortune most closely approximate the hydrogen ion optima in their processes are most succcessful, other factors being assumed a constant. Still comparatively few mills have adopted any system of chemical control.

To one familiar with the almost amazing transformations wrought in the fermentation, sugar and other industries since the establishment of such a system, it is indeed surprising that pH control has received so little consideration in the textile industry and is not in almost universal application.

The reasons for this lack of appreciation are numerous but most of them can be grouped under one of the following heads:

1—The non-uniform character of the raw stock would rather render chemical control futile.

2—Benefits to be derived not commensurate with confusion and discord such a system of control would engender.

3—Failure of executives to recognize changing conditions.

4—Past experiences with chemical innovations discouraging.

5—Ignorance regarding pH.

6—pH control unsuccessful.

Unlike glass or metallic substances, the raw products with which the average textile manufacturer deals are somewhat heterogeneous in character and are often derived from a variety of sources, each lot exhibiting slight but discernible peculiarities. A uniform final product is, of course, essential and it is encumbent upon the manufacturer to so treat his raw stock as to yield a finished article possessed with approximately a standard "hand," luster and color. Thru years of experience the feeling exists that the variations in the raw stock (more apparent than real) can only be effectively leveled by experienced foremen familiar with the properties of the raw stock and able to convert them into a uniform final product. Any system of chemical control would, of course, reduce the importance of the mill operators and is meeting with the frank hostility of these "heads."

It might be added that textiles are no more heterogeneous than the raw products from which leather and flour are derived and that these industries are today under very precise chemical control.

Any change in system temporarily produces some confusion and discord, but such a turmoil would be but little greater in the textile industry than in many others which have adopted pH control of processes with complete success. The financial and quality advantages to be derived from such a system are very difficult to calculate and no attempt will be made here to compute them. It will be sufficient to say that they will vary according as to the pHs of a mill's process solutions deviate from the optimum.

The third reason listed above as a reason for the failure of executives to recognize the importance of pH control in the textile industry, namely the changing conditions in the industry, is of some importance. In the past the industrial problems were fewer than at present. Most material was of uniform composition; all silk, cotton or wool, with a few silk-wool and wool-cotton combinations. The dyestuffs were also less numerous and the requirements for color fastness and irregularities of construction far less exacting. The growth of the industry, the introduction of new synthetic fibers and dyestuffs, the increasing popularity of color and fiber combinations and the added demand for greater tintorial fastness have added to the complexity of textile manufacture and requires much more careful supervision and chemical control than in the past. The failure of some executives to recognize these changing conditions is contributing to the inability of their corporations to successfully compete with competitors equipped with the more modern systems of control.

Such control to be of value must be exact. It should be in the hands of a suitably trained chemist equipped with accurate chemical tools and vested with sufficient authority to oversee and supervise processes.

Many executives are disinclined to grant this authority because of past failures with chemical research. Until very recently the chemistry of most textile operations was obscure and complex and no instruments were available to quantitatively measure such characteristics as hand, color, luster, etc. As a result but little valuable work was contributed to the industry by chemical research and most of the innovations of scientific character introduced failed to find acceptance. The result is that many textile executives bearing in mind past chemical failures are inclined to be rather skeptical regarding pH and its value in textile work and repose more confidence in a dyeing foreman who tests the acidity of his dye liquors by sense of taste rather than by indicator papers or a pH machine, and this is true even in some mills which have introduced pH control and pronounced it a failure.

The reasons for this failure are many but a common cause has been an improper selection of color indicators and this is the phase of the subject which will be given consideration in this paper.

There are two general methods employed in determining pH, the so-called electrometric and colorimetic systems. The former is considered too slow and complicated and moreover requires the services of a trained physical chemist to be of service for purposes of control, so the latter is the method most generally employed. While the colorimetric method is sufficiently accurate for many purposes, it is not an infallible means of estimating the hydrogen ion concentration of all solutions. Certain chemicals—sales, proteins and oils—deflect the colors from their true indicator range and furnish sometimes very misleading results. The literature is full of inaccuracies regarding the optimum pH for certain operations, the figures furnished having been obtained by the colorimetric method without corrections, and some of the results and conclusions have been applied to the textile industry with a very unsatisfactory conclusion. Also in attempting to duplicate some recommended process requiring the maintenance of some definite hydrogen ion value erroneous and inaccurate conclusions are reached because of the inaccuracies of the indicator employed in determining this value.

The writer recently investigated such a failure. For degumming gum silk-celanese broad goods combinations it is sometimes recommended that the cloth be exposed to a one per cent olive oil soap solution for a period of four hours at a temperature of 180°F. During the stripping operation, due to the union of the alkali of the soap with the fibroin and sericin of the raw silk, the basicity of the solution gradually falls and its stripping potency is considerably reduced. In order to maintain the original degumming power it is advised that successive small additions of sodium phenolate be added, keeping the pH of the solution between 10 and 10.2. The company employing this formula used phenolphthalein as their indicator.

Phenolphthalein for most purposes accurately covers the pH range from 8.6 to 10.2 but with a one per cent soap solution there is a displacement of the color band amounting to about —0.8. In other words, a neutral soap solution with a pH value of 10.2 determined electrometrically will show a figure of between 9.4 and 9.6 on a comparator using phenolphthalein as the indicator and a corresponding variation in more alkaline solutions. Cellulose acetate or celanese is very susceptible to saponification in strongly basic liquors being readily converted into cellulose and the acetate of the alkali and the failure of the process, with the corporation alluded to, was due to the excessively high alkalinity of the scouring solution which at no time exceeded pH 10.2 with the phenolphthalein indicator but which in fact was in excess of 10.7.

Another type of material which is giving trouble in degumming because of the use of improper pH colorimetric indicators is gum silk-wool and gum silk-worsted combinations. These are invariably scoured in "neutral" soap-solutions at temperatures close to or just under boiling. The pH of such a solution should not exceed 10.0 lest the worsted be irreclaimably deteriorated. Several cases of excessive weakening of the wool has come to the writer's attention and in every case the damage could be traced to an excessively high basicity in the scouring operation even in mills which were attempting to keep the process under chemical control but which were employing indicators registering inaccurate results. Experiences

such as these tend to cause the average mill executive to look upon pH control with some skepticism.

Because the success or failure of many operations in degumming and scouring depend upon the acquisition and maintenance of a definite degree of alkalinity, and because many of the color indicators commonly employed to estimate this basicity furnish inaccurate results, experiments were designed to determine the magnitude of the colorimetric error involved in determining the pH of soap solutions, as the writer can find no record of such a study having been made.

Clark, in his standard treatise, "The Determination of Hydrogen Ions," lists some twenty-one indicators useful and suitable in covering the pH range of a neutral soap solution. However, many of these lack the necessary sensitivity and stability and the result is that in commercial practice but seven are in actual use and recommended as satisfactory. These are Nitro Yellow, La Motte Purple, Phenolphthalein, Cresolphthalein, Thymolphthalein, Thymol Blue and Alizarine Yellow R.

The above indicators with the necessary standards were secured and various commercial textile soaps warranted free from carbonate and caustic tested against them and against the hydrogen electrode. Most of these soaps were soda soap derived from olive or red oil.

Before use the indicators were checked with standard buffer solutions of known pH and proved sufficiently accurate for commercial work.

The soaps were made up into one per cent solutions and aliquots removed from each for chemical analysis. The results of the analysis follows the calculations being corrected and computed to the moisture basis of the original samples:

TABLE I

Soap Analysis

Constituents	Soap 1	Soap 2	Soap 3	Soap 4	Soap 5
Moisture	24.91	30.11	29.38	33.07	24.86
Combined Alkali	7.26	6.83	7.02	5.98	6.98
Free Alkali as Caustic	none	none	none	trace	0.05
Free Alkali as Carbonate	0.44	0.21	0.31	0.34	2.01
Fatty Acid Anhydrates	63.56	62.80	62.98	58.31	62.21
Free Fat (Ether Extract)		1.27	.84	2.10	2.16

Aliquots were also removed from the soap solutions and tested for pH with the hydrogen ion potentiometer (L & N type) and on the comparator with the indicators listed in the table below. The results of the tests follow:

TABLE II

pH of Soap Solutions

Machine	Indicator	pH of 1% Soap Solutions Soap 1	Soap 2	Soap 3	Soap 4	Soap 5
L&N Potentiometer		10.18	9.68	10.01	10.28	10.84
Hellige Comparator	Nitro Yellow	10.2	10.0	10.1	10.4	10.8
LaMotte Comparator	LaMotte Purple	10.2	9.6	10.2	10.4	10.8
Hellige Comparator	Thymol Blue	9.0	8.7	9.1	9.1	9.4
LaMotte Comparator	Thymol Blue	9.0	8.7	9.0	9.1	9.4
Hellige Comparator	Phenolphthalein	9.5	9.1	9.3	9.8	10.1
Hellige Comparator	Cresolphthalein	9.0	8.6	8.8	9.0	9.6
Hellige Comparator	Thymolphthalein	9.4	9.4	9.4	9.4	9.7
Hellige Comparator	Alizarine Yellow R	10.4	10.4	10.4	10.4	10.8

The above table indicates that of the indicators tested only Nitro Yellow, La Motte Purple and Alizarine Yellow R are suitable for determining the pH of soap solutions without some form of correction.

From the results here described and from the experiences of many investigators with other indicators the conclusion cannot but be reached that it is highly desirable for the worker to first standardize the behavior of his indicators against the hydrogen electrode using solutions and conditions prevailing in his work in order that he might become familiar with and form some estimate of the errors that may be introduced.

Without some such comparison with correctives for possible deviations, inaccurate determinations are likely to result and the value of hydrogen ion control disreputed.

Deterioration in Cotton Material

Behavior Towards Reagents

By A. J. HALL, B.Sc., F.I.C., F.T.I.

ALTHOUGH cotton yarns and fabrics are extremely durable in wear and resist tension and abrasion to a surprising degree, they are easily susceptible to attack by acids, alkalis, and oxidizing agents such as are used in bleaching, dyeing, and finishing, whereby they lose much of their good wearing qualities. It is thus obviously the object of the careful dyer and finisher to conduct his processes so that the cotton is deteriorated to the least possible extent, but, however much care is taken it is inevitable that occasionally cotton materials do become damaged and for this reason it is important that simple and accurate tests should be available for the detection of damage and for indicating, if possible, its cause and extent.

Cotton, which consists very largely of cellulose, is a highly complex colloid. Because of its complexity small changes may occur in the arrangement of the atoms of carbon, hydrogen, and oxygen in its molecule without being detectable by changes in its chemical composition. It is for this reason that the properties of a cellulosic fibre cannot be accurately predicted by a determination of its chemical composition. Thus, cellulose isolated from wood has distinctly different properties from the cellulose of cotton, although both types of cellulose have the molecular composition denoted by the formula $(C_6\ H_{10}\ O_5)_n$. In dealing with cellulosic materials such as those of cotton it is necessary to have tests other than those of a purely chemical character.

Action of Acid or Alkali

When cotton is subjected to the action of acid or alkali, or an oxidizing agent, and the conditions of time, temperature and concentration exceed certain limits, the cotton becomes degraded. This degradation may be recognized in a number of ways, but is in all cases a direct result of a reduction in the complexity of the cellulose molecule. If the conditions attending the treatment of the cotton are but moderately drastic it is probable that the molecular changes which result are of the type:

$$(C_6\ H_{10}\ O_5)_n \longrightarrow (C_6\ H_{10}\ O_5)_{n-m}$$

but if definitely drastic, then the changes may result in the formation of substances having a molecular composition different from that of cellulose. Thus, cotton slightly overbleached with bleaching powder still retains its composition $(C_6\ H_{10}\ O_5)_n$ whereas cotton treated with concentrated sulphuric acid is converted into glucose having the composition $C_6\ H_{12}\ O_6$.

Deteriorated or degraded cotton usually has less tensile strength, less resistance to rubbing, and is more susceptible to chemical or bacterial attack. None of these properties can be easily or rapidly measured and it is therefore by means of other properties simultaneously affected by the degradation that degradation is detected. Chief among the cotton's affected properties are its viscosity in cuprammonium solutions, its affinity for Methylene Blue, its reducing action towards alkaline solutions of copper, its

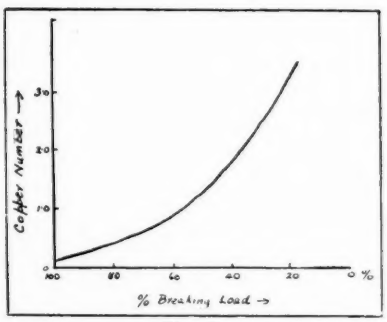

Fig. 1

resistance to dyeing by direct cotton colors, and its solubility in solutions of caustic alkalis. Other properties of the cotton may be affected but in a manner less definite than those mentioned.

In many instances the behavior of degraded cotton towards various reagents and influences is dependent on the method by which it is degraded. Thus, cotton degraded by overbleaching with a solution of sodium hypochlorite may or may not have a resistance to direct dyes. Cotton tendered with hydrochloric acid may not necessarily have an increased affinity for Methylene Blue, whereas cotton similarly tendered with sulphuric acid certainly has. For these reasons it is not usually possible to utilize but one test for detection of the deterioration of cotton; deterioration can only be detected with certainty by observation of the behavior of cotton towards all the reagents previously mentioned—copper salts, direct and basic dyes, and caustic liquors.

It happens, however, that one test is capable of detecting degradation or deterioration in cotton however the damage is produced. It is found that the viscosity of a cuprammonium solution of cotton is always lowered if the cotton is previously treated with agents which degrade it, however small that degree of degradation may be.

This test is therefore a very useful one, but because of its universal utility it cannot give any indication of how the degradation has been produced; this is an unfortunate limitation. In the remaining part of this article, attention will be drawn to the essentials of the various tests now available for the detection of deterioration in cotton materials.

Refinements in the method of conducting this test have been largely worked out by the British Cotton Industry Research Association and in particularly Clibbens & Geake (*Journ. Text. Inst.*, 1928, 19, 80). Essentially the test is conducted by dissolving a small amount (about 0.1 gram) of the sample of cotton to be tested in a glass tube, about 25 cms. in length and 1 cm. in diameter, terminating at its lower end in a short length of capillary tubing. The cuprammonium solution contains per litre, 15 grams of copper, 240 c.c. of ammonia, and not more than 0.5 grams of nitrous acid, and the quantities of cotton and cuprammonium solution used are such as to yield a 0.5 per cent solution of cotton, calculated on its anhydrous form. During the process of solution and the determination of the viscosity of the resulting solution, air (oxygen) must be rigorously excluded since it considerably affects the viscosity. Agitation of the mixture of cotton and cuprammonium solution during the process of dissolving the cotton may be obtained by attaching the tube to the spokes of a bicycle wheel rotating at a rate of not more than four revolutions per minute. After perfect solution of the cotton is obtained (this requires about 12 hours) the time taken for the flow of a definite volume of the solution through the capillary tube is measured and this is taken as a measure of the viscosity of the cotton solution. It is found that the time of flow of a 0.5 solution of a

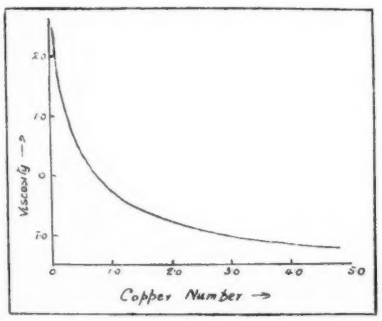

Fig. 2

pure undeteriorated sample of cotton is exactly equal to that of a solution of glycerine in water of sp. gr. 1.1681 (64.4 of glycerine by weight). If the sample of cotton being tested occupies less time in flowing out of the viscometer than that of normal cotton then it may be concluded that the sample has suffered degradation. The extent of the degradation is indicated by the degree of lowering of the viscosity or decrease in the time of flow.

Drastic Treatment

Cotton which has been degraded by drastic treatment with acids or oxidizing agents is able to reduce salts to their cuprous form, the reducing action being generally proportional to the extent of the degradation. The reducing power of degraded cotton may be determined under standard conditions and is then known as the "copper number" of the cotton. The copper number is the amount of copper in grams which is reduced to its cuprous form by 100 grams of the cotton, under standard conditions. A normal cotton which has been bleached without deterioration usually have a copper number of about 0.3 whereas an overbleached cotton may have a copper number of 8 or even more. The following table indicates how the reducing power of cotton is affected by oxidation, these results being obtained by Knecht and Thompson (*Journ. Soc. Dyers and Col.*, 1922, 38, 132).

Oxygen absorbed by cotton copper number

1	atom per $C_6H_{10}O_5$	14.0
3/4		13.2
1/2		12.7
1/4		9.1
1/8		7.2
1/12		6.6
1/16		5.3
0		0.6

The copper number of cotton also increases when the fibre is treated or tendered with acids. Birtwell, Clibbens and Ridge (*Jour. Text. Inst.*, 1926, 17, 151) have recently prepared a number of degraded samples of cotton by steeping it for prolonged periods in solutions of sulphuric acid, and have determined the copper numbers and tensile strengths of the samples obtained in this manner. The curve in Figure 1 shows the intimate relationship between the loss of strength (degradation) of the cotton and its copper number. The same investigators have also shown (Fig. 2) how closely the lowering of the viscosity of the degraded cotton follows its increased copper numbers.

For several years the copper number has been used as a measure of the degree of degradation suffered by cotton during processes of bleaching. Recent work by Birtwell, Clibbens and Ridge (*Journ. Text. Inst.*, 1925, 16, 28), however, has shown that the copper number cannot be regarded as an accurate measure unless the conditions of bleaching are known. In particular, it is found that the degree of acidity or alkalinity of the bleaching liquor has an important effect on the copper number of the resulting cotton. If cotton is overbleached in a liquor whose acidity or alkalinity is maintained constant, the copper number steadily rises with the extent of overbleaching, but if cotton is bleached in solutions of the same concentration but differing in acidity or alkalinity then the copper number is variously affected. This effect is shown by curve A in Fig. 3, it being evident that cotton more readily attains a high copper number in acid bleach liquors than in those maintained alkaline.

It is also important to note that the copper number of degraded cotton may be reduced nearly to normal by prolonged boiling in dilute solutions of caustic soda. Thus,

by means of the copper number alone it would be difficult to detect degradation of overbleached cotton which has been alkali-boiled. On the other hand, the viscosity of the cotton in cuprammonium solution is not materially affected by alkali treatment. These interesting facts are supported by the following results:

Copper Number

Before alkali-boiling	*After*
0.10	0.02
0.20	0.04
0.35	0.11
0.50	0.15
5.32	0.71
7.3	1.01

Log Viscosity

Before alkali-boiling	*After*
+1.46	+1.30
+0.48	+0.39
—0.25	—0.27
—0.63	—0.76
—0.65	—0.76
—0.86	—0.92

Full details of the method used for determining the copper number of cotton are given by Clibbens and Geake (*Journ. Text. Inst.*, 1924, 15, 27), this method being more satisfactory than the previous one, which employed Fehling's solution.

Affinity for Basic Dyes

It has long been known that cotton which has been degraded usually has an increased affinity for basic dyes, and particularly for Methylene Blue. Within the past four years several investigations on the affinity of cotton for Methylene Blue under various conditions have been carried out by the British Cotton Industry Research Association and the results published in the *Journal of the Textile Institute*. These results contain much that is of interest to bleachers and dyers.

Pure normal cotton has a small definite affinity for Methylene Blue, this affinity being proportional to the alkalinity of the ash remaining when the cotton is burnt. But by oxidation, the affinity is considerably increased. Cotton tendered by treatment with acids has an increased affinity for Methylene Blue when the acid employed is sulphuric or phosphoric acid, but if tendering is effected with hydrochloric acid then the affinity is not appreciably increased.

When cotton is degraded by overbleaching, the increased absorption of Methylene Blue shown by the cotton is dependent on the acidity or alkalinity of the bleach liquor just as in the case of the copper number previously described. The effect of acidity or alkalinity in this manner is clearly shown by the curve B in Fig. 3. It is evident that acid bleach liquors result in a cotton having a high copper number and low Methylene Blue absorption, whilst alkaline bleach liquors produce a cotton having a comparatively low copper number and a high Methylene Blue absorption.

Raw cotton has also a greater affinity for Methylene Blue than normal purified cotton, but it is not difficult to distinguish between imperfectly scoured cotton and degraded cotton. When degraded cotton is boiled for several hours with 2 per cent caustic soda its high Methylene Blue absorption is lowered but slighly, whereas that of the impure cotton steadily decreases until all the impurities are removed.

It is found that degraded cotton has an increased solubility in alkaline liquors. Clibbens, Geake and Ridge (*Journ. Text. Inst.*, 1927, 18, 277) have investigated this solubility closely, and find that in cases where the copper number does not exceed 2.5, the loss in weight suffered by a degraded cotton on boiling for four hours with 1 per cent caustic soda is equal to about six times the copper number and is independent of the method by which the degradation was produced. On the other hand, when the copper number is higher than 2.5, oxidized cottons experience a smaller loss of weight and acid tendered cottons a higher loss of weight than is indicated by this relation.

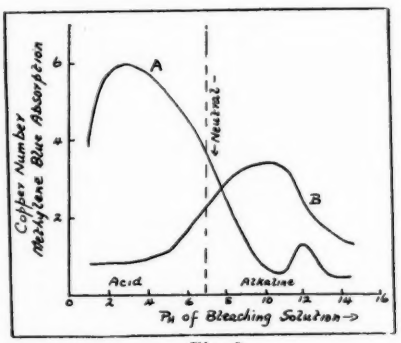

Fig. 3

After six hours boiling in a 1 per cent solution of caustic soda, the copper number of a degraded cellulose is generally reduced to one-fifth of its original value, but if the boiling is conducted under 20 lb. pressure the reduction in the copper number is reduced to one-tenth. Under similar conditions the Methylene Blue absorption of a degraded cotton is slightly increased.

It will be evident that considerable research is yet necessary for a clear understanding on the behavior of degraded cotton in the tests described above.

Degradation in cotton, however produced, may be detected by the lowering of its viscosity in cuprammonium solution. Degradation may also be detected by means of the copper number provided that the cotton has not been boiled with an alkali. Cotton having a high copper number will probably become yellow during storage.

—*Dyer and Calico Printer.*

Color Takes Possession of Cotton Bags

By Waldon Fawcett

THE hopes of cotton bag manufacturers were raised when one of the most prominent marketers of Florida oranges was recently persuaded to make a trial of cotton bags as containers for retail units of oranges. Up to that time the practice almost universally in the trade had been to make retail sales of oranges from bulk or to distribute in wooden boxes. If the orange producers could be converted to consumer-packaging it would stand as one of the triumphs of the new-uses-for-cotton movement.

Considerable thought was given to the responsibility of providing an orange bag, that there might be devised a container capable of exerting sales appeal as well as bringing a reduction of transportation costs. To that end there was devised as bag material a loose-weave or mesh fabric calculated to minister to the supposed longing of the every-day purchaser to see what he is buying before completing the transaction.

As luck or lack of foresight had it, however, the special orange bag was duncolored. This dull tone proved its undoing. Perhaps the effect was too suggestive of the burlap covering that has never been associated with appetizing foodstuffs. Be that as it may, the bagged oranges failed of consumer-acceptance and the marketer announced, in disgust, that he was through with the experiment. At this juncture, one of the Federal specialists, who is scouting for fresh outlets for cotton fabrics, made contact with a manufacturer who, through a change of fashion or an erroneous estimate of demand, had been left with an undigested surplus of some 100,000 yards of an open-mesh fabric designed originally as a foundation for embroidery or other forms of needlework.

As it happened, this job lot was not only obtainable at a price to compete with paper bags but, more to the point, it was of a brilliant pink tint, verging on an orange tone. The Government service man, armed with this more lively medium, persuaded the orange marketer to make another try. Bags were made up of the colored material and there was a complete and quick reversal of the popular verdict. The color had attention-arresting quality that operated whenever there was an opportunity for store display. And, while there had been no opportunity to plot color harmonies it turned out that the hue was suggestive of the color of the ripe oranges and yet was just enough off the shade to emphasize by contrast the color of the contents.

This is just one incident in the surge of color that is following in the wake of the very pronounced current trend to textile bags as commodity carriers. The case of the potato producers in Maine and Idaho is likewise in point. Not so long ago the potato marketers revolutionized their policy by forsaking, for the higher grades of their output, the traditional wooden barrel and sacking the select tubers, in units of, say, 25 pounds, for transmission unbroken to ultimate consumers. In the beginning, white bags were used. But the public reaction did not meet expectations. Not even when the grower's brand was emblazoned on the bag in full color. So, latterly, the potato packagers have decided to go to the limit in color capitalization. Not only have bags of solid color been requisitioned but checkerboard designs in two or more colors have been introduced in combinations chosen for high visibility.

The surrender to color in the cotton bag industry is due mainly no doubt to the desire to benefit by this most effective means of investing a container with advertising value or trade-mark value. There is, however, another factor, viz., the resistance of color to the havoc of handling storage. It has been found, by experience, that the white cotton bags which have lately come into extensive use as containers for sugar, salt, rice, etc., are likely to become soiled while awaiting distribution unless carefully stowed and handled. The colored bag is more immune to finger marks, and slight discolorations are minimized.

If the textile bags, and particularly cotton bags, continue to claim increasing slices of the container supply business of the United States it is inevitable that a new and promising market for American dyes will be unfolded. The advance finds its only contingency in the ability of bag makers to meet price competition. Thus far, surprising results have been achieved in keeping costs of fabric bags down to the approximate level of the heavy paper bags, or so nearly on a par that the slight price advantage of paper is more than counterbalanced by certain compensations in the textile medium.

Oddly enough, the present-day enthusiasm for color in the home is operating indirectly to drive a large proportion of the cotton bag users into the arms of color. One of the points most strongly stressed, in persuading the public to acceptance of textile bags in preference to paper containers, is the "after use" value of the bags. In advertising and demonstrational campaigns it is emphasized that the cotton bag, after it has served its primary purpose as a foodstuff carrier, may be adapted to use as a dish cloth, a mop or any one of a number of household utilities. Just here is where the color urge is operative. The craze for color in the kitchen encompasses, of course, the most humble appointments and market investigators have discovered that the average housewife, if thinking in terms of the premium value or "reuse" value of a cotton bag, will vote in favor of the bag that is colorful.

That color, in its new ascendency, is strongly en-

trenched in the cotton bag line is indicated by the fact that its status has not been affected by the latest modification of bag fashions. For a time it appeared that the mesh- or loose-woven bag—a newcomer in its more extreme forms—was likely to sweep all before it in the bag market. Latterly, objections have appeared. Notably, the complaint that the mesh construction affords poor facilities for the imprinting of the trade mark or other inscriptions desired on a bag. As a compromise, there has but just now been introduced the "combination" or "two-faced" bag. This is mesh on the reverse, to allow inspection of contents, but has, on the face, a close-woven fabric that will take an impression of the most complex trade mark. Persons who had gained the impression that the all-over color technique came to bagdom with the mesh bag have speculated on the fate of color in double-purpose bag construction. The color trend has not been interrupted. Indeed, some of the color enthusiasts insist that the two-texture bag affords all the better vehicle for focusing attention upon a recognizable or individualistic color scheme. Missionary work in behalf of color in cotton bags is being carried on by the Division of Cotton Marketing, Bureau of Agricultural Economics, U. S. Department of Agriculture, in cooperation with the Cotton-Textile Institute.

Effects of Raw Silk Defects in the Dyeing and Finishing of Knit Goods

Text of Address by Louis F. Auger *to I. T. R. S. C.*

THE defects of raw silk noted and observed are the following:

Unevenness, cleanness, waste, bad casts or hairiness, small and long slugs, long knots, corkscrew, and their effects are particularly noted in the dyeing and finishing of the following manufactured goods: knitted, skein dye and piece dye.

Knit goods: The objectionable defects stressed are unevenness, cleanness and hairiness. The defects plainly show after dyeing and finishing and cannot be eliminated in any preparatory processes, and the degumming accentuates the defects.

Other defects such as slugs, knots, waste and corkscrew are generally taken out in the preparatory processes, and if by any unforeseen cause get by, these latter defects jam up the needles, etc.

Since chiffon hosiery became the vogue, the unevenness and cleanness have been the worry of the hosiery manufacturer, causing a close inspection after dyeing and finishing and the casting out of one-third the production as seconds, hence the manufacturers' willingness to pay a premium for his better grade of raw material.

Piece Dyeing: The enumerated defects are very much accentuated during the degumming, weighting and dyeing processes, particularly since the excessive weighting became the vogue. On warp face fabrics, such as satins, etc., the defects become very apparent, as they lay on the surface and coarse threads, slugs, corkscrew and bad casts are noticeable.

Streaks in plain weaves, such as flat crepes, failles, crepe de Chine, Cantons, caused from uneven raw stock, particularly if a group of coarse or fine ends get together in the warp. If dyed in dark shades the coarse ends absorb more color and hence the streaks are more pronounced.

Skein Dyeing: The defects show plainly after the processes of weighting and dyeing. After the degumming, the defects are loosened and the weighting process accentuates the defects and very often the bad casts show very hairy and the dyer is accused of overboiling and many unjust claims are made.—*American Silk Journal.*

Phi Psi Fraternity Hold Twenty-Seventh Annual Convention

The twenty-seventh annual convention of Phi Psi, largest textile fraternity, will be held at Bellport, Long Island, May 8-11, inclusive. The New York Alumni Chapter, this year's host, has arranged an interesting and enjoyable program.

The Grass Patch Inn, Bellport, N. Y., has been selected as headquarters. Due to the exceptional opportunities offered for a real get-together, this year's convention will start Thursday evening, when active chapter delegates arrive, and last until Sunday.

Sports, both indoor and outdoor, have been planned. A speed boat and a larger craft have been chartered so that those wishing to go fishing or sailing may be accommodated. Golf and tennis privileges at the Bellport Country Club are available.

The informal gatherings of Thursday and Friday will be topped off by the Grand Council meeting Saturday morning and banquet that night. Grand Vice-President John H. Grady, manager Boston Office, A. Klipstein & Co., will act as toastmaster, and Dr. E. H. Killhefer, President Newport Chemical Works, will be the principal speaker. Other prominent members in attendance will include Grand President Arthur R. Thompson, southern manager, Rohm & Haas; Harold H. Hart (leader of the New Hampshire Senate), and one of the founders of the fraternity.

The committee in charge of the convention is headed by Harrison F. Wilmot, manager Dyestuff Department, A. Klipstein & Co., Dr. Jos. F. X. Harold, consulting chemist, and A. Henry Thurston, assistant editor Textile World.

Phi Psi Fraternity has active chapters at the Philadelphia Textile School, New Bedford Textile School, Lowell Textile Institute, Bradford Durfee Textile School, North Carolina State College, Clemson College and Georgia Institute of Technology. There are also a dozen alumni chapters located in important textile centers of the East and South.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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Lowell Textile Junior Section—
Earle R. McLean, Chairman; Alfred J. Carbone, Secretary.

MARCH MEETING OF THE RHODE ISLAND SECTION

THE March meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held on Friday evening, March 28th, in the rooms of the Providence Engineering Society.

On motion duly made and seconded, Albro N. Dana was unanimously elected to serve on the General Nominating Committee for this year.

William H. Cotton gave a very interesting talk on "Colloresine, a New Thickening Agent."

Another interesting speaker was R. W. Marsson. His subject was "New Developments in Dyeing with Naphthol AS Products."

Both gentlemen are associated with the General Dyestuff Corporation. Seventy-five members were present.

A. Newton Graves, *Secretary.*

Colloresine, a New Thickening Agent

By W. H. Cotton
General Dyestuff Corporation

PRINTERS have used for many years past a variety of thickening agents to meet their requirements. Of these, starches either as such or burnt are the most important. Natural and artificial gums are also used to a large extent. For printing pigments casein, albumen, and in later years, acetylated cellulose have been employed. I should now like to call your attention to a new thickening agent which has been offered in Europe for some time in a slightly different form, but which is only now available in this country. The product I refer to is put on the market as Colloresine DK and has some very interesting properties.

Colloresine DK is a water-soluble cellulose compound and is offered in the form of cubes in 1, 4 and 10 lbs. These cubes are dissolved by pouring over them about twenty-four times their weight of boiling water. The cubes swell and must be stirred well in order to remove any small lumps which may have been formed. The mucilage is then allowed to stand over night, and in cooling down a complete solution takes place. The resulting product is a viscous and homogeneous thickening. Additions of sulphocyanide of potassium or ammonium, or solvents such as glycerine or alcohol, or of organic acids such as acetic, lactic or tartaric acid, promote the swelling of the Colloresine DK and improve the smoothness of the paste. On the other hand, salts, alkalies of a certain concentration and tannins cause the Colloresine to separate out in flakes. Thickenings made from Colloresine DK are stable and are not liable to become sour or mouldy, which

is so often the cause with other thickenings. For most purposes, a thickening made with 5 ozs. Colloresine DK per gallon will be found suitable. The most important characteristic of Colloresine DK, however, is the following: it is soluble in cold water, but if the solution is heated, it becomes insoluble. On cooling off, it again goes into solution. It also becomes insoluble in the presence of alkalies. Owing to these properties Colloresine DK is of interest in printing for the following purposes:

Colloresine DK can be used in printing with vat colors. In this case the usual printing method has, however, to be modified. The vat colors are mixed with Colloresine thickening without any addition of Rongalite or alkali. After printing and drying, the goods are passed through a Rongalite developing bath containing Rongalite C and carbonate of potassium or soda. As soon as the Colloresine DK comes in contact with this bath, it becomes insoluble, and the prints therefore do not bleed. The goods are then dried and steamed in an ager under the ordinary conditions for vat colors. When washing the goods after aging, the Colloresine DK thickening is easily removed. Similar to all gums which wash out easily, Colloresine DK does not give such full shades as thickenings made from starch. It has, however, been found that it is possible to use a certain amount of starch thickening in conjunction with Colloresine DK without having to fear that the prints will bleed when the goods pass through the Rongalite developing bath. Starch alone, of course, would bleed badly, as it is not made insoluble by an alkaline process, and Colloresine DK is only able to bind a certain amount of starch, but it has been found that equal parts of a Colloresine DK thickening and a starch thickening can be used without detriment.

In making up the vat color printing pastes with Colloresine, it is best to mix the vat color paste with water, then to stir it into a starch thickening and to add the Colloresine DK thickening last. A typical formula for printing vat colors according to this process is as follows:

PRINT PASTE

250 parts	Vat dyestuff in paste
20 parts	Dissolving Salt B
80 parts	Water are stirred into
350 parts	Neutral starch thickening
50 parts	Glyecine A
250 parts	Colloresine DK thickening
1.000 parts.	

THICKENING FOR REDUCTIONS

300 parts	Neutral starch thickening.
50 parts	Glyecine A
300 parts	Colloresine DK thickening
350 parts	Water
1,000 parts.	

COLLORESINE DK THICKENING

940 parts	Hot water (175°F.) are poured over
40 parts	Colloresine DK and when swelled the whole is well stirred, and
20 parts	Sulphocyanide of ammonium are added
1,000 parts.	

Perfect solution results when the thickening cools down to about 85° F.

STARCH THICKENING

100 parts	Wheat starch are made into a paste with
880 parts	Cold water, boiled for about ¼ hr. with
20 parts	Ammonium sulphocyanide and cooled while stirring
1,000 parts.	

RONGALITE DEVELOPING BATH

100 parts	Rongalite C
100 parts	Potash or 50 parts soda ash are dissolved in
500 parts	Water.
75 parts	Glyecine A or glycerine
3 parts	Nekal BX
50 parts	Glauber's Salt are made up to
1,000 parts.	

Vat colors on the whole do not present great difficulties in printing according to the ordinary method. By using Colloresine DK an extra process of padding and drying has to be introduced, so that for machine printing the Colloresine DK may not offer any great advantages. I should like, however, to mention that by using Colloresine DK there is no fear of heavy blotches, marking off or dirtying the rollers in the ager which so often happens when using the ordinary Rongalite-potash printing process.

The Colloresine process has, however, great advantages when it is desired to print vat colors on surface printing machines as there is no fear of the printing colors acting on the felt, which would always be the case with alkaline pastes such as are usually used.

Then for block or spray printing, Colloresine DK offers great advantages. All block printers now have difficulties in the use of vat colors as the printed goods must be aged as soon as possible. Goods printed with Colloresine DK may, however, be allowed to lie any length of time before aging, as there is no Rongalite C present which can deteriorate.

I should also like to mention that with Colloresine DK it is possible to print warps with vat colors. This has never been accomplished so far, as the Rongalite will have decomposed long before the warps can be woven and aged.

A process of minor importance which, however, illustrates the properties of Colloresine DK very well is the printing of cloth on a lithographic press. It is not pos-

sible to print an ordinary vat color printing paste on a lithographic press as the photo-engraved pattern is so shallow that contrasts in shades are difficult to produce. With a Colloresine DK thickening mixed 1:1 with a vat color paste, beautiful effects can be produced on a lithographic press. After printing, the goods are passed through the Rongalite developing bath and treated as described above.

It is natural that trials have also been made to eliminate the extra padding process which the use of Colloresine DK necessitates, and very interesting results have been obtained. It has been found that it is possible to pad the printed goods with a solution of ordinary hydrosulphite conc. powder and caustic soda, and then, without drying, to steam them for 30 seconds with as dry a steam as possible at 230-240° F. in a steam chest placed behind the padding machine. The goods are then washed with cold water which has been slightly acidulated with acetic acid, oxidized with one-half gm. sodium perborate per liter, at about 120° F., washed and soaped. Should it be desired to tint the goods, small quantities of vat colors can be added to the hydrosulphite developing bath. As compared with the Rongalite-potash process, this Colloresine-hydrosulphite process has the following advantages:

(1) The prints have an unlimited stability before aging;
(2) No crystallizing-out of the Rongalite C or of any other compounds in the printing paste is to be feared;
(3) It is possible to produce simultaneously pale ground shades with print-ons.

A typical formula for the Colloresine-hydrosulphite process is as follows:

PRINTING PASTE

200 parts	Vat dyestuff in paste
10 parts	Dissolving salt B
125 parts	Water
300 parts	Starch thickening
50 parts	Glyecine A
300 parts	Colloresine DK thickening
15 parts	Castor Oil
1,000 parts.	

The Colloresine DK thickening and starch thickening are made as described above.

HYDROSULPHITE DEVELOPING BATH

200 parts	Common salt are dissolved in
800 parts	Water of about 140° F., then
2 parts	Monopole Brilliant Oil or Prestabit Oil V
20 parts	Acetone and
90 parts	Caustic Soda 76° Tw. are added.

Before use, thirty to forty parts Hydrosulphite conc. powder are stirred in.

Colloresine DK is not suitable as a thickening agent for basic colors, as tannin precipitates it; but for printing with mordant colors, it offers noteworthy advantages. Colloresine DK does not form insoluble compounds with chromium salts and is easily removed from the fiber by washing, leaving the goods soft.

Colloresine DK is also very suitable as a thickening agent for printing diazotized bases and color salts on a Naphtol prepare, but it cannot be used in conjunction with Rapid Fast colors.

Discussion

QUESTION: What is the price of Colloresine?

ANSWER: I did not want to mention the price to-night, but as the question is asked I might say that it is the intention to put Colloresine DK on the market in this country at the present moment at $1.00 per lb. It has been calculated that at this price it works out cheaper than a first class gum tragacanth.

QUESTION: Can Colloresine DK be used for vat colors when they are printed alongside of Fast Color Salts?

ANSWER: This is not possible as the Color Salts would be affected detrimentally by the Rongalite developing bath.

QUESTION: Is it possible to print an aniline black alongside of a vat color thickened with Colloresine?

ANSWER: One might be able to do so if the goods were steamed before passing them thru the Rongalite developing bath.

New Developments in Dyeing with Naphtol AS Products

By R. W. MARSSON
General Dyestuff Corporation

WHEN I was asked to speak again before this Association on naphtol colors, it meant my first opportunity to broach the subject before the members of the Rhode Island Section where the interest in these products and the development in the application of same has been most pronounced. I pride myself on not being a stranger in this part of the country, for it was my good fortune to co-operate in a give-and-take manner very closely with many of you in the successful promotion of these colors.

The extensive research work centering in the problem to obtain the best possible fixation of these insoluble azo colors on various textile fibers and its subsequent transfer into practical channels necessitated considerable time and effort. However, the value of these colors has by now been generally conceded by the textile trade. The fields of application are constantly widening with additional experience gained, and further developments point to the establishment of a complete line of shades in the very near future.

As I happened to be one of the "head nurses" presenting the "little red-haired naphtol baby" to the textile trade, I was at first rather disappointed by the cool recep-

tion accorded this pet child of mine, especially by the old-timers in fast color work. All kinds of faults were discovered in the newcomer. Some proclaimed it too loud in tone, others insisted that the little pigment needed too much soap to get it clean; very close observers even spoke about it staining the white sheetings. The majority, however, soon found out that these troubles, like the measles and the whooping-cough, meant no serious handicap to its growth and with good treatment they eventually disappeared. While the "child" is still young, it has become a "brilliant youth, full of future possibilities."

It will not be necessary for me to-night to go back into the chemical history of these insoluble azo colors, for it would mean a repetition of all that has already been said and written on the subject. It will no doubt appeal to you much more if we walk into the dyehouse and review actual accomplishments on a practical scale. In view of the broadness of the subject, I will have to confine myself to the dyeing of these products on various textile fibers, emphasizing the additional experience gained, and outlining to you the value of recent additions in naphtols as well as developing agents.

The acceptance by the trade of these colors has been principally due to their brilliancy in shade, economy in production possibilities, as well as good fastness properties to washing, light and bleaching. The development in dyeing was closely followed by the development in printing, two large fields of application not always of allied nature, although the general treatment and fastness properties hold good to a large extent in both. The many printers present, therefore, will no doubt also be interested in these new developments, and especially in the new additions which are suitable for discharge as well as print-on styles.

I shall endeavor to outline the application of these colors for piece dyeing, which is the most important field in this section, and then in a more general way touch on the progress being made in their adoption on rayon, silk, package machine dyeing and warps.

We are living in an age where color is taking the right of way from white goods. Exquisite taste is creating new shades and blending these in a most pleasing manner to the eye. These have invaded the manufacture of plain white sheetings, pillow cases, bedspreads, curtains, handkerchiefs, etc.—a touch of color seems to be wanted in about everything, and the evolution in regard to the general demand for fastness includes even these fields. Fastness to washing is followed by a higher demand for light fastness, eliminating developed colors and, to a great extent, sulphur colors for lack of brightness. The general development on the whole front points to Indanthrens and Naphtols, and to the application of these products on a production basis.

The importance of up-to-date machinery has become more and more evident, and with keen competition in a market much depressed by unstable cotton and financial disturbances, the progressive mill owner, in order to keep up his efficiency, cannot afford to fall behind for want of adequate equipment.

You will all agree with me that these last few years have made history in the research laboratories as well as in the dyehouses. Chemists and colorists had to do some fast stepping in order to keep abreast of developments, and there were no doubt nightmares in many otherwise happy homes. In spite of all this and their comparatively speedy introduction, the naphtols have not been large trouble-makers. There were, of course, many hurdles to take, but large users of these products have often remarked to me that when once established, the operation of same runs smooth.

In the application of naphtols on piece goods, it is, of course, essential that the material have been properly desized and kiered; all foreign substances have to be removed from the fibre. The best and most economical way to impregnate naphtols is the padding method. They are dissolved according to the new cold dissolving method which is being generally adopted. Formerly, clear solutions could only be obtained by more or less prolonged boiling; and several of the more substantive types, such as Naphtols AS-SW and AS-TR showed only limited solubility if, as for padding work, high concentration was essential. The large proportion of oil heretofore necessary proved a handicap in so far as it formed an aluminum soap with the aluminum sulphate used as a stabilizer in the developing salts. Very much better fastness to crocking is thereby obtained, eliminating to a large extent the excessive cleaning action in the after-treatment. The new method replaces the oil used in pasting up the various naphtols with denatured alcohol and recommends the addition of a small quantity of a protective colloid, such as monopole brilliant oil or Turkey red oil, or Eunaphtol K. The proportion of caustic soda necessary to form the naphtolate remains practically unaltered. To obtain a perfectly clear solution, only a small amount of the total required caustic soda should be used in pasting up. For Naphtol AS as well as the substantive Naphtol AS-SW, only 3 oz. caustic soda in solution are necessary per 1 lb. of naphtol to obtain a perfectly clear solution without raising the temperature. The balance of the caustic to be used with each naphtol has to be added along with a small amount of oil or Nekal BX as a sharpener to the dye liquor before the naphtol solution is being added to the same. If this is not done the naphtol will fall partly out of solution when added to the large volume of liquor. The padding temperature varies according to the nature of the material from 100 to 140° F. The speed of the padding is kept at sixty to eighty yards per minute for heavy, and up to 100 yards per minute for light shades.

In order to prevent tapering, it is advisable to dilute slightly the starting bath with water. The proportion of this dilution differs according to the substantivity of the naphtol. Some care is needed to control the padding of highly substantive naphtols, such as Naphtol AS-SW and AS-BR over large yardage. If the starting pad contains about ten gallons, a 30-per cent dilution of same is advisable to obtain evenness throughout the piece. The impregnated material is best dried in between and then developed either by the padding method again or, as has been largely adopted, in the continuous machine. According to the depth of the shade and the nature of the salt, a skying operation is necessary to fully couple the naphtol on the fiber. This skying operation varies from fifteen to forty-five seconds. The entire line of reds shows instantaneous developing action and, therefore, needs the shortest air passage, while the blues, such as Dianisidine, Variamine Blue and the new Blue BB and Blue RR need more lengthy air passage.

After the goods have been fully coupled, they have to be after-treated first by washing out the remaining diazo solution and then by thoroughly soaping and hot water. This process is best carried out in the open width continuous machine or, on light-weight material, in the rope form. An after-treatment in the jigger does not fully remove the surface lake formation.

Substantive naphtols, such as AS-SW, AS-TR and AS-BR can be rinsed in an alkaline salt solution after the naphtol prepare. In view of the fact that a large amount of alkali is carried over into this rinsing liquor, a plain salt rinse of 2 oz. per gallon is sufficient to remove the surface naphtol from the fiber without disturbing the already fixed dyestuff. These three naphtols can very well be dyed in the jigger without removing the piece during the dyeing operation. The goods are naphtolated at 120 to 140° F. by splitting the naphtol solution over the first two ends and giving two more ends with a small addition of common salt to obtain the best possible exhaustion. The material is then washed once or twice with salt, as stated before, and developed with the base or salt in two ends. On these substantive naphtols good fastness to crocking in most instances can be obtained by carrying out the cleaning action in the jigger. It is essential to remove all traces of soap by a thorough treatment with boiling water.

On this occasion I would like to draw your attention to a recent improvement that has been made in cleaning thoroughly heavy shades of naphtols with a brushing device on the jigger. Three rotary brushes are attached in such a manner that both sides of the material come in contact with the bristles. This operation removes the last particles of color lake still adhering to the fiber, and produces the much desired fastness to crocking in a most simple and speedy manner.

Whether or not it is advantageous to add formaldehyde to the impregnation liquor has very often been discussed. The elimination of such an addition can only be considered, in my opinion, in such cases where very little time is lost between the impregnation and the coupling, and where the material (as is generally being done in piece dyeing) is put on drying cans right after the impregnation pad. In all cases where mill conditions or application methods necessitate time between the two operations, additions of formaldehyde to the impregnation bath are of very great value. It is a well-known fact that naphtolated material, although to a lesser degree than that impregnated with betanaphtol, is very sensitive to the influence of air, light, and especially acid fumes. These influences very severely affect the fixation of the prepare, in some cases as early as in the dehydration process and, of course, in exposed storage. Spots or light streaks will appear in the coupling action which can hardly be removed by re-dyeing. The reason for this partial destruction of the naphtol is to be found in the splitting off of the sodium betanaphtolate into free naphtol and caustic, and it will then couple very slowly and insufficiently. The sodium salts of the various Naphtol AS products show various resistances against these destroying influences. While the impregnation of some of the naphtols disintegrates very quickly, others are less affected. With AS-BR, for instance, the resistance to air and storage is such that the product can in all cases be applied without any additions of formaldehyde whatever. Naphtol AS-G, alone, should never be impregnated with formaldehyde, as it precipitates.

In speaking of the new developing agents which have recently been put on the market and others that are to be introduced in the near future, I would like to mention Variamine Blue Salt B first, as this very valuable product on its recent introduction for piece-dyeing encountered unexpected difficulties in its adoption.

The Variamine Blue base, which was first introduced, is an aromatic base of close relation to the other bases of the naphtol group; however, it shows different reactions throughout. It produces a garnet shade after coupling which is unstable and of no particular fastness properties. The nitroso group splits in the soaping process and changes the shade slowly to a blue. Therefore, the base is complicated in its application and rather impractical for production purposes. Since a 50 per cent salt of this base could be produced, we discontinued advocating the use of the base. This color salt is readily soluble, contains magnesium salt, is free from nitroso compounds, and therefore needs no splitting of the nitroso group. It produces its proper shade in the coupling action, and has gained large popularity for reasons of its brilliant cast, its adaptability on AS and AS-D grounds for piece-dyeing, printing and discharge work.

Extensive experiments were necessary to establish the proper dyeing method which is different from that of other coupling agents, in so far as the best results can

only be obtained by splitting the developing action into two stages. The impregnation is carried out in the usual manner; the material is then dried and padded in the Variamine Blue salt coupling liquor with an addition of acetic acid. After an air passage of about 15 seconds, the material is entered into a cold soda ash bath.

In a more definite way this process is carried out as follows: The padbox contains 10 gallons of liquor. Use 12 grams of naphtol per liter (equal to 480 grams per 10 gallons). The naphtol is dissolved according to the alcohol method, and small additions of oil and Nekal BX made for levelling and penetration purposes. Impregnation is carried out at 120° F.

To pad 200 lb. of material, the entire padding solution is made up to 35 gallons. Four lbs. of Naphtol AS are needed, which are made up in approximately 35 gallons of liquor. Of this solution, 8 gallons are added to the starting box and 2 gallons of water also added to fill up to 10 gallons. After the impregnation the material is dried and developed with 35 grams of Variamine Blue salt per liter. Therefore, the developing padding solution is made up with 10 lbs. Variamine Blue Salt B, dissolved by pasting up with a little lukewarm water and then adding cold water. To this an addition of 3 quarts of acetic acid 50 per cent is made and the entire padding solution is diluted to 35 gallons. It is not necessary that the developing action take place at an extremely low temperature; it has proved advisable, especially for tightly woven material, to bring the temperature up to 110° F. After the coupling the material needs an air passage of approximately 15 seconds and is then entered in a cold solution of 20 lbs. soda ash in 250 gallons.

According to this method, on account of the slow coupling action of the diazo compound in acid solution, the dyestuff formation takes place as soon as the excess acid is neutralized by the soda ash. The great advantage of this method is the good stability of the developing liquor, in spite of its high concentration, for continuous work. Furthermore, the second stage of the coupling action in the alkali medium takes place instantaneously. The skying operation has to be timed in order to prevent a splitting of the naphtol before the alkali treatment. Too much air exposure leads to lighter dyeings. For the same reason it is advisable to hold a liberal proportion of alkali in the impregnation bath.

After the soda passage the dyeing process could be interrupted without damage to the shade or evenness, and the soaping is carried out according to equipment at hand, being best in the continuous machine.

The neutral developing action with additions of magnesium or zinc salts did not prove practical for production purposes, and very extensive experiments which I had occasion to carry out according to this method did not lead to success. In this process there is a great tendency of the diazo compound to decompose and heavy bleeding occurs in the soaping until the proper shade is obtained. For this reason any other method but the acetic acid soda method has to be discarded for dyeing plain shades on piece goods.

Variamine Blue B produces on various naphtols, navy blues from greenish to reddish cast. On Naphtol AS and AS-D grounds the light fastness is exceptionally good, and for reason of comparison can be termed far superior to Indigo. The fastness to crocking and washing is excellent on all grounds. The bleaching fastness is inferior to that of the majority of the naphtol combinations; the best bleaching fastness possible can be obtained on Naphtol AS-E, a new naphtol put on the market at the same time.

Another new and very valuable blue coupling agent is being brought out under the name of Fast Blue RR base and salt which will soon be available. It produces very fine shades on Naphtols AS, AS-D, AS-OL, AS-TR, as well as AS-E. The fastness properties of these combinations are very good throughout. They excel in fastness to washing and crocking, light and bleaching. This new blue is very suitable for piece-dyeing, as well as print-on styles. The base diazotizes very easily and the diazo solutions are stable. The blue can easily be discharged with Rongalite and Anthraquinone. In comparing the light fastness of this blue with that of Variamine Blue, it may be termed very slightly inferior: Variamine Blue on AS and AS-D has been accepted for Indanthren fastness.

Another new addition of more greenish character and extremely brilliant in shade is the new Fast Blue BB base and salt. The strength of the salt is forty per cent of the base. The fastness properties of this product, to chloride of lime bleach and boiling caustic, on the majority of naphtols, deserve special mention. It is extremely suitable for the dyeing of colored bleach goods.

The application of Fast Blue BB is simple, and it will be found suitable for practically all methods of dyeing. To give you an idea of the quantity of base required: for deep shades in a volume of liquor of 1:20, 131 grains per gallon; in a volume of liquor of 1:10, 198 grains per gallon. For padding purposes, one part of naphtol in the most important combinations requires the following proportionate parts of base: Naphtol AS, 1.6; AS-D, 1.55; AS-TR, 1.4; AS-SW, 1.35. Since the Fast Blue BB salt is a 40 per cent salt, the proportions can be figured accordingly.

Fast Blue BB couples directly to a blue of reddish cast and changes over to its proper shade in the soaping aftertreatment. If coupled according to the padding method, a skying operation of about 45 seconds is necessary to develop the naphtol on the fiber.

The most pleasing shades of greenish cast are obtainable on Naphtol AS and AS-D grounds. Very bright navy blues are obtained on AS-TR, AS-BO, AS-E and

AS-SW. On the last mentioned naphtol, it produces a very rich shade of navy blue in a heavy yield and can be dyed in the jigger also.

Fast Violet B base and salt: this is the first time that a violet of very good fastness properties could be produced with naphtols. All shades produced are excellently fast to washing, boiling water, ironing and bleaching. The tinctorial value is very high and therefore rich shades of violet can be produced very economically.

On Naphtol AS, Fast Violet B produces a bluish violet, while redder tones are obtained in combination with Naphtols AS-TR and AS-RL. The fastness to light can be termed very good in heavy dyeings; in medium and light shades, however, it disintegrates to such an extent as to place the light fastness not very much above that of developed colors. The proper shades of violet can only be obtained in the soaping after-treatment. In order to accelerate the change from garnet to violet in continuous work out of short submersion, it is advisable to make additions of caustic or soda ash to the soaping liquor. The bleeding action in the case of the violet is somewhat more severe than with the blues, but a thorough soaping in the continuous form or in the rope, produces very good fastness to crocking.

Fast Corinth Salt V conc.: This new salt again provides a new shade, heretofore unobtainable with naphtol colors. It answers the demand that has been evident in the trade for some time past to produce rich corinth or chocolate tones. Formerly these shades could be obtained only by using Indanthrens topped with AS compounds. Fast Corinth Salt V conc. has been brought into the market only in the form of a 35 per cent color salt. Its application is extremely simple and the solution is obtained in the usual manner by pasting up with a little lukewarm water first and diluting with cold water. The maximum solubility of this product is 7 oz. per gallon. It is adaptable for dyeing in the open tub as well as in the jigger. For piece-dyeing, according to the padding method, it appears that only light and medium shades can safely be obtained. The fastness to washing is excellent, the fastness to chloride of lime bleach is very good, and the fastness to light can be termed as good in all combinations.

There is comparatively little difference in shades obtained on various naphtols, the only exception being on AS-D ground where a deep shade of brownish maroon is obtained.

Fast Red RBE Base: This is not exactly a newcomer to the market, but it is rather strange that the perfect kier boil fastness of this new base on AS-SW ground has not won for it a more receptive market in this country. We are, of course, aware that Turkey red dyed material is still imported to a large extent principally by the towel trade, but it seems that the expense of importing this material would exceed the cost of producing the equally fast naphtol combination here. Naphtol AS-SW in conjunction with Red RBE base produces a clear bluish red very similar to the Turkey old red. Outside of its fastness to kier boiling under pressure, it is extremely fast to chlorine, washing and light. Its suitability, therefore, stretches over a wide field for fast color work, and principally for towels and colored bleach goods. It can be dyed on any equipment at hand and is well suited for package machines. The cost of producing this combination for dyestuffs and chemicals ranges between 20 and 30 cents per lb. which, in my opinion, is hardly above the cost for the imported Turkey red. The popular combination, Naphtol AS-SW Fast Red KB base, while it is fast to boiling caustic, does not quite come up to the general fastness of RBE, and loses heavily in depth if the kier boiling is carried out under pressure.

With these new additions in developing agents and less recent additions in naphtols, such as AS-E and AS-OL, there are now in the market twelve various naphtols, seven bases of which there are no color salts and twenty-two color salts in all. To complete the line of shades, only a deep brown and green are needed, and there are prospects of obtaining both within a reasonable time.

In speaking about the application of naphtols on other fibres, such as art silk, and in other fields of application, such as machine and warp dyeing, I will touch the subject only in a general manner, as I had occasion to go into it more in detail previously and nothing substantially new has developed since. In these fields, too, where large strides have been made in the adoption of this group of colors, the new alcohol dissolving method has proved extremely valuable in obtaining better penetration and fastness to crocking.

The elimination of the formation of aluminum soap on the fiber has been instrumental in retaining the luster of the artificial silk. The cause for the blinding of same, however, should not be looked for in this point alone. It is a subject which has had much attention both here and on the Continent. The blinding or masking of the rayon when dyed with insoluble azo colors is partly due to the crystallization of the coloring matter into larger aggregates within the fiber produced by moist heat. It is a well-known fact that after-treatment does influence the shade and fastness of material dyed with pigment colors, and therefore soaping is very important to obtain the necessary fastness to light and rubbing by removing the loose surface lake formation. Artificial silk should not be soaped at temperatures higher than 140 to 160° F. In addition to this, different naphtols, by reason of their constitution, show different reactions on the luster of artificial silk. The best results are obtained with Naphtol AS-G; then

follow AS-BO, AS-SW, AS-BR, AS-RL, etc. Another important fastness property of decided practical value is the fastness of the majority of the naphtol combinations to desulphurizing. (Showing card with combinations that possess this fastness.)

While the progress in the adoption of naphtols on real silk has not kept abreast with that on other fibers, the importance of these colors for reason of their all-round fastness properties should not be overlooked. There are two general methods of dyeing naphtols on silk: first, the dyeing of degummed silk or of raw silk; and secondly, the dyeing and degumming of raw silk in one process. The latter process, however, is only recommended if there is no use for the boil-off liquor. Each process is distinguished by the composition and application of the impregnating baths. The preparation and use of the developing bath is the same. The impregnating bath is exhausted by an addition of common salt and must be freshly prepared for each lot, the same as the coupling liquor. As usual, the dyeing process consists of two stages: first, the impregnating of the silk in the naphtol solution; and secondly, the developing of the impregnated silk in the solution of diazotized base.

Since the impregnation of silk can be carried out cold with as little caustic as necessary to form the beta-naphtolate, little harm is done to the fiber. However, as an additional precaustionary measure, additions of glue or protectol fully insure the tensile strength and luster of the silk. Protectol not only protects the silk from the damaging effect of alkalies, but also brings about a more uniform absorption of the padding liquor, as in combination with freshly dissolved glue it accelerates favorably the solubility of the naphtols which is diminished by the necessary reduction in the amount of Turkey red oil.

The developing baths are prepared as is customary. No lime or aluminum salts are added, and sodium acetate is used for neutralizing. In consequence of the considerable affinity of the base for silk, the developing liquor is made up more strongly acid than is usually the case, in order to prevent the silk from being dyed yellow, which is most frequently the case. After developing, the yarn is rinsed once in cold water and then passed through a hydrochloric acid bath (2 qt. 32° Tw. per 100 gal. at 100° F.), rinsed again warm and treated for one-quarter hour in a weak soda-alkali bath, to which an addition of protectol can again be made. The material is then soaped twice for 20 minutes near the boil, rinsed hot and cold, scrooped if required, and dried.

The process described, with few modifications, can also be applied to tin-weighted silk without the weighting being damaged. In this case, about 15 cc. silicate of soda solution 42° Tw. per liter are added to the impregnation bath. With the exceptions of AS-G and AS-BR, all naphtols are suitable for dyeing weighted silk.

For the dyeing of this group of colors in closed package machines, the substantive types, such as AS-SW, AS-BR and AS-TR, should be applied. With these naphtols, the entire dyeing process can be carried out without removing the material. On non-substantive naphtols, in order to obtain proper dehydration, it is necessary to hydroextract the packages before they are developed.

A very popular method of dyeing for which the entire range of naphtols can be used very economically is in the warp form. The most used type of machine for this purpose is the five to eight box continuous machine. In this the impregnation is carried out of a short liquor in the first compartment; in order to obtain the full benefit of the naphtol liquor, the warps are passed through this liquor twice by taking them back over leaders and returning them to the same impregnation bath. On non-substantive naphtols, the second compartment is usually kept empty in order to cool off the warps and to give them the benefit of another nip. They are then developed in compartment No. 3 and rinsed and after-treated in the usual manner in the remaining boxes.

Since there have been frequent complaints about the men in the dyehouse being subjected to bodily harm when handling these products, I might on this occasion make reference to preventive measures that can be applied to alleviate trouble of this nature. Skin diseases, sometimes of serious nature, affecting certain individuals more than others, appear most frequently. The cause of these may be partly looked for in careless handling of strongly alkaline solutions, as well as diazotizing fluids. The skin dries and splits in places, allowing these harmful solutions to enter under it, inflaming and infesting the hands. The wearing of rubber gloves should be insisted upon, and the hands should be well bathed in hot soap before working with naphtols. One of the best preventive agents which has been placed on the market for this purpose is the Dimazon ointment manufactured by the Heilkraft Corporation. It should be rubbed into the skin after washing the hands. It is the bad practice of many men to clean their hands with strong bleaching liquor, which makes them harsh and more receptive to the ill effects of these compounds.

Naphtols, as well as diazo salts, are marketed in fine suspension, and if handled in quantities, tend to dust and therefore are apt to affect the breathing organs. The mouth and nose should be protected either by a cloth or mask.

The nitrous gases which appear in the diazotization of bases are most harmful, and the dyehouse workers are rarely sufficiently informed about the poisonous character of same. Persons severely afflicted should immediately

be brought into the open air and given artificial respiration. An absolute cure against the gases has not been found as yet, and it is best to pick a crew that is inclined to be immune to the ill effects of same.

I feel that I have covered the subject in its present phase from the dyehouse angle, in so far as general rules of application are concerned. There is no doubt in my mind that many of my friends in the trade who have followed the developments in the naphtol products from their pioneer days have had their own experience in adapting same to their needs and equipment. As is the case with all fast colors, especially when their introduction into practical channels is still more or less in its infancy, very close co-operation between the colorist and dyer is bound to be of the greatest interest to the textile trade.

Discussion

1. Can naphtols be applied to celanese?

A. I would not recommend the application of naphtols on celanese; they offer no advantage against special products now on the market for this material.

2. Can a deep shade of blue be discharged to a good white?

A. Yes; in a heavy discharge with Rongalite, Anthraquinone and possibly caustic. For discharge purposes, all naphtol blues are not as easy a proposition as the reds.

3. How about the new violet?

A. Violet discharges much more easily.

4. How does AS-SW with Red RBE base stand up under peroxide?

A. It is the fastest combination to peroxide bleach. There are a few others I would also recommend for this purpose: AS-SW and AS-TR with Red KB and Red TR bases.

5. Can AS-SW Fast Red RBE base be stripped?

A. I have been up against this very proposition not long ago. One of our customers sent us a skein dyed with Fast Red RBE base on Naphtol AS-SW ground which had turned out too heavy in shade and bled considerably. We tried to strip it with hydro and caustic with no result whatever. We also tried other agents with no more success.

I must say that the cleaning action on this combination is somewhat more difficult than with KB base. I found it advisable after a very thorough soaping and after washing out the soap to submit the material to a treatment with plain hydro at a raised temperature. This can be done as a cleaning action since no stripping occurs.

6. You mean with an addition of alkali?

A. Slight additions of caustic can also be made to the cleansing action without detriment to the shade.

7. Can copper sulphate be applied on naphtol blues?

A. What particular use of copper sulphate have you in mind?

8. To increase the fastness to light.

A. Yes, but only with Dianisidine which is Fast Blue salt B. Combinations with this developer are rather poor in fastness to light, being termed as low as 2-3 in the light table; by an addition of copper sulphate the light fastness increases to 3-4 at the most.

9. You mentioned Naphtol Red a good substitute for Turkey Red. Is it replacing Turkey Red in the Old World?

A. This is principally a question of price. Of course Turkey Red is still dyed a good deal on the other side and is imported into Canada as well as the States. I have especially a Southern mill in mind.

AS-SW and Fast Red RBE is in every way as fast and just as pretty in shade as Turkey Red. It stands up perfectly well to light and weather, is very good to bleaching and withstands kier boiling under pressure. This combination is of a more recent nature and if the application is carried out in the most economical manner, it should easily compete successfully against Turkey red.

10. What about Naphtol greens, straight or in combination with other colors?

A. This problem I have practically given up. We have worked consistently in order to obtain satisfactory results and since you mentioned the subject of combining naphtols with other groups of fast colors, I feel that I might say a few words about this. I have about given up the attempt to combine naphtols and vats in one bath for skein and machine dyeing. However, the vat can be dyed first and a suitable naphtol combination used on top to obtain certain heavy shades of good fastness more economically. Much better results have been obtained in combining naphtols with Indigosols by putting the Indigosol in the naphtol prepare, developing the naphtol on the fiber with a base or salt and then developing the Indigosol in a sulphuric acid bath.

MARCH MEETING OF NORTHERN NEW ENGLAND SECTION

THE Northern New England Section met in Cambridge on Saturday, March 22. Professor Donald C. Stockbarger of the Massachusetts Institute of Technology spoke on "Some Characteristics and Uses of Ultra-voilet"; and Francis J. Curtis of the Merrimac Chemical Co. on "Handling Heavy Chemicals." Thirty-three attended the dinner in Riverbank Court Hotel, and about fifty were present at the meeting in the Physics Department of Massachusetts Institute of Technology.

The next meeting, on Saturday evening, April 26, in Riverbank Court Hotel, will be addressed by Henry F. Herrmann of General Dyestuff Corporation, and Dr. H. A. Lubs of the DuPont Co.

HAROLD C. CHAPIN, *Secretary.*

Proceedings of the American Association of Textile Chemists and Colorists

Handling Heavy Chemicals

By Francis J. Curtis
Merrimac Chemical Co.

WE CAN define heavy chemicals as those which are sold in large amounts at relatively low prices. Among those of chief interest to textile chemists are the common acids such as sulphuric, acetic, muriatic and formic; the alkalies such as caustic soda, soda ash and lime; various types of bleach such as liquid chlorine and calcium hypochlorite, sodium peroxide, sodium bisulphite and miscellaneous products such as bichromate of soda, aluminum sulphate and chloride, sodium sulphide and ammonia.

Sulphuric acid itself is sold in a large number of strengths. Of those chiefly used in the textile trades 50° Be. containing 62.18 per cent H_2SO_4, which can be handled satisfactorily only in lead. Fifty-eight to 60° Be. is satisfactory in steel if cold but if the acid is likely to become at all warm or to be actively moved, such as in a pipe line or through valves, it might be wiser to continue the use of lead for this purpose. We have found, however, that steel storage tanks have been used satisfactorily for these strengths of acid for a number of years and particularly for 60°. For the ordinary so-called oil of vitriol 66° Be. steel is quite satisfactory below temperatures of 150° Fahrenheit. Above this temperature either cast iron or special irons such as Duriron are used. While lead is, of course, satisfactory, particularly in the cold, there is no need to use this more expensive equipment. Higher strengths of sulphuric acid are not usually met with in textile finishing.

It is also of interest to consider the peculiar freezing points of sulphuric acid. These are given below:

50°	Below	—40° F.
57°	"	
60°	"	+11° F.
62°	"	+46° F.
65°	"	+17° F.
66°	"	—25° F.

You will note the great variation from minus 25° F. for 66° Be. to plus 17 for 65° Be. There is more than a little danger in the winter time if acid is allowed to become diluted in an outside storage tank of finding the tank solidly frozen. Once frozen, due to the low conductivity for heat, it is very difficult to free the tank.

On the smaller scale sulphuric acid is usually shipped in carboys, closed with a porous stopper and an asbestos gasket. It is very important that pieces of this gasket, which always contain a certain amount of cotton, not be allowed to fall into the acid since thereby the acid is blackened and may be considered impure. We also advise in moving open carboys that a loose lead cap be placed over the neck of the bottle to avoid spilling.

The simplest way of removing acid from a carboy is to tip it over and pour it into a pitcher. For tipping the carboy we advise one of the numerous types of inclinators which are on the market rather than the traditional block of wood, since the latter often slips and unpleasant results follow. It is also possible to place a lead siphon in the carboy, puttying up the opening, leaving a small glass tube through which sufficient pressure to set the siphon can be easily obtained by blowing. Once set it is only necessary to turn up the end of the siphon above the level of the liquid when not in use.

In handling drums of acid it is wise to keep them out of the sun, because like all liquids the acid expands and with sufficient heat a considerable pressure may result. It is wise also to loosen the plug as soon as received so that any pressure developed may release itself. If the plug sticks it will usually be found to respond to treatment with a steam hose. It is especially necessary with fuming sulphuric acid not to allow any excessive heating of the drum on account of the possibility of the development of gaseous SO_3. Drums should be emptied by screwing in a piece of pipe with a nipple and elbow to act as a spigot.

For 66° all iron gate valves are nearly always used although Duriron cocks to handle small amounts are very satisfactory. Earthenware cocks are also good but fragile; even with Duriron a great deal of care must be exercised.

For gaskets we use the thinnest possible long fiber asbestos, 1/16 of an inch thick. For strengths up to 66° rubber can be used, but for this and higher strengths only asbestos is satisfactory. For storage, steel tanks can be employed down to 55° Be., below that lead lined or brick lined are necessary. For the dilute acid used in pickling or souring, hard pine will be found quite satisfactory. A word of caution is necessary with regard to steel tanks in the open. If the dome cover is left off and a heavy rain should come up it is quite possible that a thin film of water will form on top of the acid, diluting the top layer enough so that it becomes corrosive to the steel. The steel tank will be found to be cut all around the level of the acid as clearly as if it were done with an acetylene torch.

In washing out an acid tank practically as much wear takes place as would happen in normal events in a year. The best way to go about it is to use a very large stream of water and do it as quickly as possible. Soda ash should be added until the water shows alkaline and until the tank is full and running over. Even after this the tank should be filled and emptied several times with water before allowing entry, to make certain that all hydrogen has been eliminated.

In connection with sulphuric acid burns one should first wipe off the acid, then flood with water and treat with mild alkali such as bicarbonate, finally covering with oil.

Muriatic acid is chiefly used in the textile trades in

connection with carbonizing and in some cases as a souring agent to avoid the formation of calcium sulphate in the goods. It is not especially dangerous physically; although it is chemically a strong acid, in commerce it appears only as a 30 per cent solution. However, no metal has been found, with the possible exception of the expensive tantalum, which will withstand its action. Hard rubber pipe seems to be as satisfactory a method as any. This can be obtained with fittings of various sorts just like steel pipe. The threads, however, must be cut on a lathe and contrary to expectations it will be found that they dull the tools very quickly. Graphite and grease or oil are used on the joints which are only turned hand tight. An important necessity in handling hard rubber pipe is the fact that it should be carried on runways usually of wood since it is a somewhat plastic solid and will be found to bend and flow in time. Expansion joints are necessary at every 100 feet on long pipe lines. Hard rubber cocks should be lubricated with graphite and may be ground in with ordinary valve grinding compound. It may be handled satisfactorily in glass or earthenware, both of which materials are made in the form of pipes. The use of earthenware eliminates to a certain extent the necessity for runways, but the lengths are shorter and more joints are necessary.

Acetic acid is used in all strengths from 28 per cent to 100. In the lower region copper or hard rubber appears to be the more satisfactory. For glacial, copper is used and if formic acid is absent aluminum may be employed.

Acetic acid burns, except in the case of glacial, are not particularly painful but have the disagreeable property of causing the skin to peel off. Due to the fact that they do not act immediately they are likely to be neglected.

Coming to the alkalies, caustic soda is usually sold in drums in the solid or flake condition or in solution. In breaking up cakes men should be equipped with goggles to avoid accidents from chips. The solutions are satisfactorily handled in iron and steel. Burns from caustic soda are sometimes hard to heal and because they are not so vigorous as acid burns are not treated as carefully.

Soda ash is a much milder alkali than caustic soda but it is treated in much the same manner.

Sodium sulphide is also alkaline in nature but not as strong as caustic soda. It is, however, quite poisonous and has the property of dissolving the hair and fingernails and causes the hands to become quite sore. It can be satisfactorily handled in iron but for gaskets rubber must be used, particularly that with a cloth insertion because asbestos is soluble.

Aqua ammonia is usually sold as a solution of ammonia gas and water at 26° Be. containing about 29 per cent NH_3. In opening a drum one should stand sidewise since there is often pressure inside. There have also been occasions where quick relief of pressure or vacuum has burst the end of the drum. All-iron pipe connections are used and all copper or brass compounds should be avoided.

Chlorine gas comes in cylinders, ton containers and tank cars at about 75 pounds pressure. It can be handled in glass, rubber or earthenware if wet and steel if dry. As is well known, it is quite poisonous and if there is any possibility of chlorine in high concentration getting in the atmosphere, gas masks should be on hand. In this connection care should be used in fitting gas masks since oftentimes a mask is condemned as useless because it leaks slightly around the face particularly on those men with high cheek bones. There are two kinds in general, in one of which the air is drawn through a pipe extending outside the building and in the other through a canister attached in which the chlorine is absorbed.

Hypochlorites are best handled in earthenware or concrete with rubber pipe lines or hose. In dilute solutions in mills they may be satisfactorily contained in wood barrels.

Sodium peroxide has a certain fire hazard. Its solutions should be kept in wooden tanks and conveyed in lead pipes. It is essential to keep it out of contact with iron and copper since these increase the rate of decomposition. This may also happen if there are iron or copper spots on the goods and the increased rate of production of oxygen usually completely destroys the goods in that spot. In some cases where bronze centrifuges have been installed lacquering renders them satisfactory. They should be watched, however, and the liquor applied frequently.

Sodium bichromate is poisonous both internally and externally. The ordinary hyposulphite solution will remove this material very satisfactorily. Aluminum salts, sulphate and chloride are not particularly corrosive in the strengths ordinarily used. They may be contained in wooden tanks and handled through lead, monel metal, brass or bronze pipes and valves. In carbonizing tanks hard rubber or wooden rolls are used.

Sodium bisulphite may also be contained satisfactorily in wooden tanks and handled in lead pipes and valves or lead lined air valves.

There are many special problems in handling chemicals which must be solved in accordance with the special conditions involved but these indicate the ordinary methods in use.

MARCH MEETING OF THE NEW YORK SECTION

THE March Meeting of the New York Section of the American Association of Textile Chemists and Colorists convened Friday evening, March 28, 1930, at the

Alexander Hamilton Hotel, Paterson, New Jersey, P. F. Kingsbury, Chairman of the Section, presiding.

The routine business of the Section was transacted.

Chairman Kingsbury: Gentlemen, we are very fortunate in having with us Dr. Elbert M. Shelton, Chemist of Cheney Brothers, who will talk to us on "Research in Silk." Dr. Shelton! (Applause)

Fundamental Research In Silk

By E. M. SHELTON
Chief Chemist, Cheney Brothers

IT IS entirely unnecessary to point out to this group the value of research applied to a material which is the basis of such extensive manufacturing interests and which involves as high a cost for the raw material as does silk. The opportunities for improvements in manufacturing processes are apparent to all thinking manufacturers and the technical research needed to bring about the best set of manufacturing conditions in a given instance will naturally be sponsored by the manufacturer. I am not concerned with these technical problems at this time.

I wish to discuss a more fundamental field for research in silk. It is a field less apparent to the practical silk man, and one to which the average industrial laboratory can make little contribution. It concerns those questions as to the fundamental nature of silk and the mechanism by which it is produced on which we have but the haziest conceptions.

A few months ago Dr. Herty was quoted in "Rayon" as follows: "A new artificial silk has been produced that is stronger than natural silk. I do not hesitate to predict that natural silk is doomed. I also predict that our cotton planters will have a real economic problem on their hands because the artificial fiber has all the advantages. There may be great economic considerations. The cotton farmer must get busy on his cottonseed to maintain his economic balance. If he cannot produce cotton for less than 20 cents a pound, how is he going to compete with wood pulp, sold at 10 cents a pound, when people are buying fabrics they prefer to cotton? There is an amazing shortage of research in this country on cellulose. We do not know what the formula of cellulose really is. In the rayon industry intensive research is going on, but industries representing a capitalization of more than $7,000,000,000 are spending practically nothing on fundamental investigation of the product which they use."

If this is true of rayon, how much more is it true of silk. An industry which flourished centuries before our modern conceptions of molecules and atoms were dreamed of is being overtaken by a competitor born yesterday, but founded upon more complete knowledge and control of its raw material. Only a few years ago our understanding of such complex aggregates as occur in cellulose was even more bewildered than our picture of the proteins of silk. Then there arose an appreciation of the need for this fundamental information, and today cellulose is comparatively well understood.

Much of the work on cellulose has been done in university laboratories with or without the assistance and encouragement of the industries founded on cellulose as a raw material. In those contacts which we have already made in behalf of silk with directors of research in public institutions we have found a very ready and heartening response. Leaders in pure scientific endeavor are very much interested in learning of the problems which face industry. But we feel that we can arouse a more unique and vital interest in silk because of its animal origin. Out of a study of silk may well come valuable contributions to our understanding of life processes which may be of general benefit to humanity.

The life cycle of the silk worm is familiar to many of you. Starting with the egg, the minute larva emerges after a few days' incubation and begins industriously to eat enough to carry it through the remaining stages of its existence. During this period of storing up materials and energy there occurs the only true organic chemical synthesis which takes place in the manufacture of silk. The transformation of vegetable proteins to the viscous solution ready to be spun by the worm to a silk fiber is a process the understanding of which challenges the efforts of all who are interested in the origin and composition of proteins. When the silk glands have fully developed and are filled with the clear honey-like solution, the worm spins its cocoon and after passing through the pupal stage, the adult moth emerges to lay its eggs and complete the life cycle.

A number of questions suggest themselves regarding these processes. Why do sericin and fibroin, emerging from the same spinneret and apparently originating in the same gland show such contrasting properties? Where do they actually originate? What is the nature of the coagulating process by which the fluid hardens to the comparatively insoluble fiber? Is it an oxidation process or a clotting like that which takes place in blood serum? How does the feeble and toothless moth liberate itself from the cocoon? Probably the liquid which it ejects contains an enzyme capable of dissolving both sericin and fibroin, but if so it possesses an activity discovered in no enzyme ever studied and described. These are not idle questions. Their solutions will not only contribute to our knowledge of silk, but will enrich the sciences of biology and biochemistry which will sooner or later find the answers.

Studies into the composition and structure of silk fibroin have been added to intermittently over the last century. It was comparatively simple to demonstrate the presence of carbon, hydrogen, nitrogen and oxygen and to show that

they occur in combinations typical of protein substances. Possibly the first indication of the unique chemical nature of silk was the observation that sulphur is absent.

Attempts have been made to calculate a formula to represent molecules of fibroin and sericin, but these assume each of these substances to be pure and homogeneous. May there not be present a mixture of proteins in fibroin and sericin? The evidence, particularly in the case of sericin, points strongly to the existence of such a mixture.

While the determination of the average molecular weight of fibroin or sericin is of limited value if these proteins are mixtures, it at least offers an interesting field for development of technique for making these measurements. Most methods for determination of molecular weight depend upon first bringing the substance either into solution or into a gaseous state. Silk fibroin is insoluble except under conditions which may be suspected of breaking down the molecule into smaller units. Very interesting work is in progress making use of the solubility of silk in neutral salt solutions, and molecular weight determinations on silk thus dissolved indicates the presence of units of weights of 500 or less. So far as we know, the method of particle size determination by which Svedberg has obtained weights of 100,000 to 380,000 for casein has not been applied to solutions of silk. Appel at the Bureau of Standards has demonstrated that the vapor pressure of silk is negligible, so it is difficult to conceive of conditions under which silk proteins may be obtained in gaseous state.

We may hope, however, that the technique and interpretation of X-ray analyses may soon be developed to yield valuable information on the size of the units of which silk is made up. This method has at least the advantage that it may be applied to the undissolved and unaltered fiber.

It is of course characteristic of proteins that they go into solution in strong acid or alkali and on continued heating yield simple break-down products known as amino-acids. In fibroin have been found about a dozen of the twenty-odd amino acids known though the highest yields of amino acids reported fall considerably short of accounting for all of the fibroin destroyed. Less work has been reported on sericin and scarcely half of this protein has been recovered as amino-acids.

Sufficiently complete and accurate work has been reported in the literature to show conclusively that sericin and fibroin are radically different in composition. Fibroin is characterized by high percentages of glycine, alanine and tyrosine, while sericin is noted for the presence of a comparatively rare amino-acid, serine. We have noticed a greatly increased interest in silk hydrolysis on the part of educational and research institutions, particularly those in which much attention is given to physiological chemistry and biochemistry.

One is also struck with the amounts of strongly acid units in fibroin in comparison with the small quantities of amino-acids in which basic qualities predominate. A leadng authority on proteins recently described silk as unique among all known proteins in this regard. It is therefore not surprising that its "neutral" or isoelectric point should be far down on the acid side, even as low as pH 2.1 as has recently been indicated.

Thus far I have raised questions of chemical and physico-chemical nature. There remain many problems no less fundamental of physical and mechanical nature. What are the forces which hold together the protein aggregates in the fiber? What is the nature of the changes which take place as silk passes successively through stages of fluid in the gland, semi-plastic and semi-elastic raw silk fiber, and ultimately non-plastic and brittle solid with age? Do damaging influences of heat, light, etc., involve chemical change or is there chiefly a change in the forces which bind the components together? Do we not need new and refined technique for measuring and defining silk in terms of more fundamental physical qualities? Progress in this direction would very clearly be of direct and immediate practical value to the silk industry.

An inducement of no small importance to the student of bio-chemistry is the relative ease with which supplies of silk proteins may be secured, whether by dissection of glands from the worm or by use of cocoon filaments, and the comparative freedom from contamination with foreign matter.

Altogether, silk offers a field for research rich in opportunity for discovery, with problems accessible to attack by many diverse branches of science, and especially full of human interest because of so much in common with the problems of life and living mechanism. If to these inducements there is added the support of an awakened industry who can predict the accomplishments and the benefits to be derived?

Discussion

Chairman Kingsbury: Are there any questions you wish to ask Dr. Shelton?

Mr. Herrmann: Mr. Shelton, that substance that you mentioned which the moth liberates or spits in order to free itself—have any quantities of that ever been recovered?

Dr. Shelton: Probably at one time we get as much as a hundredth of a c.c.

Mr. Herrmann: I wanted to know whether I could get four ounces for some experiments. (Laughter)

Dr. Shelton: We were just a little stingy along that line last summer. Of course, that was only a preliminary sort of work and a great many of our worms we killed before they were allowed to spin in order to examine the silk in the glands. We let twenty or thirty perhaps

mature, but did not try to collect the solvent fluid in any quantity. All of these experiments were merely feelers to see what we could get.

Mr. Herrmann: Would you say that this was one of the few solvents that would dissolve silk without materially changing it so that it could again exude a silk filament?

Dr. Shelton: No, I rather think that this thing the worm uses to dissolve its way from the cocoon may damage the silk fully as much as any solvent we could get. I think it is more hopeful in that to work along the line of solutions prepared by dissolving in strong salts as Von Weimarn has done. Some very interesting samples have been prepared by independent workers dissolving silk in various ways and respinning it into fibers which had, at least in one instance which has come to our attention, as good qualities as rayon in elasticity and strength.

Chairman Kingsbury: Are there any other questions? Howard B. Bishop, of the Sterling Products Co., Easton, Pa., will now talk to us on the "Application of Fluorides in Textiles." Mr. Bishop! (Applause).

Application of Fluorides on Textiles

By Howard B. Bishop
Sterling Products Company

I SEE your Program Committee has prepared for you a chemical sandwich this evening. You have the organic constituents on the outside and the inorganic on the inside. I am going to discuss an inorganic subject.

When Mr. Herrmann asked me a few months ago to be with you this evening I hesitated because it seemed like just one more thing in an already busy schedule but when I though of all the times that I had gone to Mr. Herrmann for information and advice and how freely he had given it to me I felt it was my turn to do something for him. So here I am tonight.

A number of years ago Professor Oswald came to this country and I remember hearing him at a lecture. In the course of his remarks he said that if there was anything better for a man than a hobby it was two hobbies.

This subject of fluorine and hydrofluoric acid has been a hobby of mine for a number of years. I first became interested in it in doing research work in a developmental process for the manufacture of hydrofluoric acid. You might be interested to know how the acid is prepared.

Formerly they mixed powdered fluorspar and sulphuric acid in cast iron retorts and heated the material for about forty-eight hours, distilling over the acid, and absorbing the gas in water. An ordinary plant would have 15 to 30 of these small stills each of which would hold about a barrel of fluorspar.

With the introduction of the sulphuric acid contact process we got a vision of making acids in a different way and I worked out a continuous process in which a mixture of fluorspar and sulphuric acid is fed into a rotating cylinder and the acid comes off continuously. One still 4 feet in diameter and 12 feet long working in this way would produce as much as a dozen or more of these small units and instead of having separate absorbing systems on each of the small units we have one absorbing system that takes care of one unit of this rotary process.

When this process was described and sent abroad I remember a German manufacturer wrote back and said it was impossible, that the process wouldn't work. We had already been using the process here for about two years. And it is interesting to note that the Germans are now using this process in some of their larger plants.

About the time that we were working on the manufacture of hydrofluoric acid I was working in the laboratory and it was about the time (perhaps some of you remember) when Sir William Ramsay came to this country and I remember he made a remark that was the cause of the inception of our experiment. He said that chemists too often fail to try the unlikely; they are forever trying the thing that they think is going to work.

One of the experiments that we tried in the laboratory was the effect of hydrofluoric acid in hydrolyzing starch. You know, hydrochloric acid is used extensively for this purpose and it was thought that if hydrofluoric acid would act in the same way that the fluorine could be removed then by precipitating it out with lime. Much to our amazement, hydrofluoric acid didn't have the slightest result in hydrolyzing the starch in making glucose.

A short time after that I embarked in the manufacture of sodium hypochlorite that is used by the laundries for bleach and I went one night to call on a laundryman that was using this product. He said during the course of my visit with him, "You are a chemist, why don't you work out something that the laundryman can use for taking out rust stains? We are bothered to death with rust stains and the only thing we have is oxalic acid and permanganate of potash and if one doesn't make a hole the other usually does." (Laughter) He said "What we want is something that will take a rust stain out like that (indicating)."

I went back to the laboratory. We were using hydrofluoric acid for dissolving iron in the analysis of iron ores and I knew very well that it was a great solvent for iron. I put my head to work on this problem and it occurred to me that if hydrofluoric acid didn't hydrolyze starch perhaps it wouldn't affect fabric. So I made up some acid salt of hydrofluoric acid and put it in a little cloth bag and took it home to my mother. I said, "Mother, if you ever have any rust stains, try this on them."

She took it and wet it and put it on a rust stain and took it out like magic. She put the little bag on the shelf, let it dry out, and used it for several months in that way. I was interested in her experiments and so one day I

examined this cloth and found it was just as firm as it was the day that I had put the salts in it.

That gave me an idea that here was a product that would eat glass and iron, and nearly every other metal, and yet would not destroy fabric. As a result of that observation I obtained a patent on the use of the product for removing iron stains and we soon found that there was a far greater application for it than simply taking out heavy stains; that the laundries were using large quantities of oxalic acid for what they called "souring" at the end of the wash, for whitening the goods, and for neutralizing the alkali. We consequently made up a product especially adapted for use in this field which we named "Erusto Salts." Our rust remover for taking out rust stains we called "Erusticator," so they both have the same family name.

I have some samples here tonight. I thought you might be interested to see them. Dr. Shelton was talking about ceresine. It reminded me of our ceresine bottles. This is what we use to handle C. P. hydrofluoric acid. We are manufacturing the pure C. P. hydrofluoric acid which is used in laboratories. There isn't any acid in these bottles so you needn't be afraid to handle them. Hydrofluoric acid is one of the most dangerous acids to handle and I would like to give you a word of advice as to how to cure an acid burn, if you don't already know. If you ever get hydrofluoric acid on your hands be sure to wash it off as quickly as you can and don't be satisfied with just a surface washing. The acid penetrates the skin very rapidly and in order to remove it, it is a slow process of dialysis and it takes considerable time.

I remember once getting some strong acid on me and I washed it for an hour and a half. As a result it only made a small blister. If it hadn't been thoroughly washed off it would have been a case for the hospital. Just remember, therefore, ice water and long washing will remove hydrofluoric acid.

On account of this dangerous property of the acid we found that it wouldn't be possible to make much headway in its commercial use unless we could put it into a safe commercial form, and these products are the acid salts of fluorine. We have the Erusto Salts, special, which are designed for removing iron stains and whitening fabrics, and the Erusto Salts regular which have a higher acidity and are more useful for neutralization.

The special application of these products for silk consists in their ability to dissolve silica or to take out weighting materials where they are put on with phosphate and silicate of soda. They also have the remarkable property of destroying odors. In washing of fabrics with soap there is a certain amount of odor that remains in the fabric and by neutralizing the odor is entirely removed. This and the bleaching action are the special values that the laundries find in the product. They have been doing a lot of the wet wash laundry work and in sending it home without souring it has a disagreeable odor, but by souring it with our product the odor is entirely removed.

I have here some of the Erusticator put up in the way we sell it and I brought along to-night enough samples to pass around so if you gentlemen are interested in taking some of this along and using it at home or in the factory you are welcome to do so. I went down to the drug store to-night and got a good substantial iron rust stain here in this handkerchief. I will see if I can demonstrate how this material works. You see, a drop put on there immediately dissolves the iron. Acid flourides have the property of making iron salts colorless. The oxide is colored while the iron fluoride is colorless.

We had a customer write in and say that they had used our Erusticator for a long time but found it was all humbug, that it didn't take out iron at all, that they washed the goods and the iron came right back again. The point was that the iron fluoride here is soluble and can be easily washed out. They hadn't removed the iron fluoride and naturally when the alkali goes onto this it will reprecipitate the iron and bring back the iron color. So you have to remember that.

We have had customers who have used this material in the dye bath where they have cloth that is iron-stained, and it is difficult to get the color to go on where the iron is. By putting the material in the bath during the dyeing process it can be whitened, the iron removed and dyed all in one operation.

Another interesting use, not particularly in textiles, although there might be occasions when it would have an application, is that when water contains algae and has a very disagreeable odor that will develop in the fabric or in paper, they can be killed by the use of hydrofluorsilicic acid. That is a compound of the hydrofluoric acid with silica. It is also useful in preventing starches from fermenting. A very small amount, one pound in a thousand pounds of starch, will prevent fermentation. Ammonium Bifluoride used to be used in the breweries, for killing the wild yeasts.

Hydrofluoric acid has the effect of actually strengthening the fabric. We don't know just how this is done but we know from actual experiments that where the fabric in the usual process of washing is weakened, acid fluorides help to maintain its strength.

We have carried out a large number of washing experiments in which we have determined the tensile strength of pieces of cotton goods after washing with Erusto Salts, in comparison with sulphuric acid, acetic acid and oxalic acid, and I have a chart here that demonstrates this. This (chart) shows the effect of sours on tensile strength of fabric at a temperature of 212 degrees Fahrenheit, after rinsing out the sour. You notice the tensile strength of the test strips is about 85 pounds before washing. With oxalic acid the strength of the fiber goes right down as

you increase the number of washes while with water and Erusto Salts the effect on the fabric is about the same.

(Chart) This chart shows the effect of the sour when it was not rinsed out—acetic acid, water, Erusto Salts are all in the same field while sodium acid sulphate, sulphuric acid and oxalic acid show very destructive action even in small amounts; if the latter are allowed to remain in the fabric they will weaken them during the drying process. The Erusto Salts are so harmless to fabrics that the laundries now follow the practice of souring and bluing in one operation and they don't bother to wash out the last trace of the sour because it is not injurious to the fabric. That saves a lot in time and in water and speeds up the process.

There was a question as to what was causing the weakening of the fiber. I think it was Mathews' book that stated the weakening of the fiber by oxalic acid was due to precipitation or crystallization in the fibers that cut the fiber. A young man who was working for his degree at Lafayette College was interested in our subject and he did some research work there for his thesis that showed it was not a crystallization—he couldn't find any trace of crystals under a high-powered microscope—but that it was due to a hydrolysis action, and as I told you in the beginning the hydrofluoric acid not having the property of hydrolyzing starch it doesn't have the property of hydrolyzing the cellulose fibers of textiles. For that reason it is harmless to fabrics.

I appreciate this opportunity of being with you and explaining our products and if any of you want samples or any information I will be glad to oblige. (Applause)

Discussion

Chairman Kingsbury: Mr. Bishop will be glad to clear up any questions if you have them.

Mr. Sorrell: I should like to ask Mr. Bishop if his Erusto Salts are effective in anti-mildew, or as a mould preventative in silk fabrics.

Mr. Bishop: I am sorry I can't answer that but we will be glad to furnish you some material if you would like to experiment along that line.

Dr. Harold: I should like to ask if it is possible to carbonize cotton by raising the temperature on cotton goods, if there be any residuals of this article left.

Mr. Bishop: No, you can't carbonize them.

Dr. Harold: If there were salt present would the potassium acid fluoride liberate hydrochloric acid?

Mr. Bishop: Yes, it would liberate hydrochloric.

Dr. Harold: It would make that transfer?

Mr. Bishop: Yes. So that is a thing to bear in mind: that if you get a weakening effect with the bifluoride it may be due to the presence of salt from a bleach or from some other source like that. We take special pains to make our product free from these other acids that have this hydrolyzing action, like sulphuric, and hydrochloric.

Alfred Winkler: On a piece of cotton cloth that has rust spots, how strong a solution is necessary to remove the spots, one per cent or less, or a fraction of a per cent?

Mr. Bishop: The practice in laundries is to use a quarter of one per cent solution and have that hot. If you have heavy stains it may take a little more; in the neighborhood of one per cent would be ample.

Mr. Winkler: What is the temperature supposed to be?

Mr. Bishop: Around 180 degrees Fahrenheit.

W. A. Kingman: I should like to ask the speaker if the neutral fluorides have an antiseptic action in preventing decomposition, like glue or casein solutions.

Mr. Bishop: Yes, they do.

Mr. Kingman: How do they rate with ordinary antiseptics, like benzoate, etc.?

Mr. Bishop: It takes a slightly larger amount for the fluoride than it does for benzoate. I think with benzoate, they put a tenth of one per cent in ketchup. Isn't that the right amount?

Mr. Kingman: I don't know. I have seen several patents gotten out where they recommend sodium fluoride as a preservative. I don't know whether it was the real thing or whether it was put in there for some other reason.

Mr. Bishop: No, I think there is real preserving action there. I believe the way that fluorides act in preventing these growths is in precipitating lime. Most of these organisms require lime in order to propagate and calcium fluoride is very insoluble. In that way I believe the fluoride is active.

Dr. Harold: There are a number of body deodorants on the market. Boric acid is a common constituent of one of them named "Mum." I was wondering if these fluorides are safe body contacting substances in underclothing and in reducing perspiration odors.

Mr. Bishop: That is an interesting question. I can best answer that by telling of the effect of soda fluoride on the workmen.

We find that if a workman perspires a lot and isn't clean about his person, washing frequently, that he will get bad sores from the dust from sodium fluoride. We very often have to change a man from the mill work in order to find one that isn't affected by the dust. The fluoride precipitates the lime in the pores of the skin, closes the pores, and makes bad sores. So fluorides cannot be used for that purpose.

Chairman Kingsbury: If there are no further questions, gentlemen, we will pass on to our next speaker, Ralph Wechsler, Technical Director of the National Oil Products Company, whose subject will be "Researches in Textile Oils." Mr. Wechsler! (Applause).

Researches In Textile Oils

By Ralph Wechsler

National Oil Products Co.

I AM going to take some liberty with the subject assigned to me for to-night and speak rather on recent develop-

ments in textile oils than the subject as exactly described, "Researches in Textile Oils."

There has been a great deal of progress during the past few years in the development of oils used in the various branches of the textile industry. It was only a few years ago that sulphonated castor oil was, with the exception of a few untreated fatty oils, the stock in trade of the dyer and finisher or anybody who handled textiles. He used it in and out of season. If he wanted to produce any kind of effect, along with a lot of other materials in his formula he would add a little Turkey Red oil. Sometimes it did some good and sometimes it didn't, but it stayed in the formula just the same.

During the past few years the trend has been away from that. Applications have become much more complex and we have hundreds of oils, sulphonated and other types, that are used for producing particular effects or aiding in certain operations.

Fortunately also during these years the work with these oils has become less empirical and the chemist has taken a good deal out of the hands of the practical dyer and finisher, without casting any aspersions on the practical dyer and finisher (I don't know the nature of my audience exactly) (laughter) and we see the development of specifications covering the various oils used, not merely from the point of view of moisture content and purity of the product but in relationship to the intended use. There has been a decided effort on the part of the manufacturer of textile oils and the users to develop oils for specific purposes so that they really will accomplish what it is desired to accomplish.

From the viewpoint of the manufacturer of oils, this growth of the specification idea of developing particular oils for each particular purpose has not been conducive to economical operation because it involves a great deal more of research; it involves a lot more expenditure of money on control work and multiplicity of products. However, I think these disadvantages are more than offset by the greater satisfaction of the user in having products that meet his requirements.

We as manufacturers—and I refer not only to the concern that I am particularly associated with but to other manufacturers of textile oils who are represented here—have been glad to aid the industry in developing these particular oils, in developing specifications, and in seeing to it that the oils do meet those specifications. I believe that there is a far healthier situation in the industry to-day than there was even ten years ago and I believe I know whereof I speak.

It is not merely however in the construction of the oils and the specifications that there has been progress. There have been developments in the past few years along three distinct lines: first, I might say, in the substitution and use of a large number of other fatty oils than castor oil which was one of the early sulphonated oils used. Secondly, there has been decided progress in the manufacture of sulphonated castor oil itself so as to enable these oils to produce other effects and to make them available for other uses. Thirdly, there has been a development of new types of emulsifiable oils, oils that do not require the use of soap or alkali other than that contained in the mixture of oils.

I shall review these three classes of recent developments. One of the most important ones I want to call your attention to has been the more widespread use of olive oil in place of castor oil, particularly in the silk industry, with which most of you in Paterson are more closely associated. Of course, the use of olive oil is not new. It was used a good many years ago but we notice and encourage the more widespread use of sulphonated olive oil as against castor oil in silk work because of several decided advantages. In the first place, olive oil products give finer finishes, softer goods, as a rule. They are more resistant to development of rancid odors. They resist the action of light and air more than the castor oil products do and also are more stable in storage of any kind.

This trend toward the use of sulphonated olive oil in place of castor has been much more pronounced in the industry here in Paterson than throughout the rest of the textile industry, I may say, showing how progressive the Paterson manufacturers are.

Of course, that doesn't mean that anything that calls itself sulphonated olive oil is better than anything which is labeled sulphonated castor. One must rely upon the knowledge of the manufacturers of the particular oils involved. One must test these oils to see that they are applicable to the particular situation at hand and in every way assure one's self that the product is suitable for the particular purpose.

I shall not dwell long on that subject because it does not involve any particularly startling advancement. It is merely an instance of the steady substitution of one product for another because it gives better service.

In the case of sulphonated castor oil for a long while there was comparatively little advance in the art and certainly very little in the science of sulphonating castor oil. Turkey red oil was pretty much the same for a good long while. Now and then some oils were produced that were claimed to have superior properties but they were hardly substantiated.

The last year or two has seen some steady progress along the line of improving sulphonated castor oil and I believe you will notice in the next year still further development along that line. A class of sulphonated oils is being developed that exhibit decidedly interesting properties. You will have oils if you haven't got them yet that are resistant to acids, alkalies, hard water conditions, far beyond any of the oils that were on the market several years ago. I am not referring to the product of any one

concern when I say that. I am referring to the industry as a whole when I say that not one but several concerns will be producing, if they are not already doing so, oils of decidedly superior properties. That does not mean that the old sulphonated castor oils are not going to be used any more. It does not mean that anywhere one wants to one can use a highly sulphonated or high acid resistant oil. It will be even more important than it has been in the past to study the application and fit the particular oil to the particular job.

Let me digress at this point to say a few words about that much abused word "cooperation." We all of us in our various industries have our secrets or think we have and are inclined to remain in our shells and not say anything, for fear that our competitor or our next-door neighbor will find out all about our business. There has been and still is too much of a barrier between the consumer and the producer of textile oils for the best interests of the industry. Fortunately, some progressive firms have attempted and have succeeded in breaking down that barrier to the mutual benefit of both sides. Usually we wait until some serious damage has been done and then the user of an oil opens up and tells his part of the story and the manufacturer of the oil opens up and tells his part of the story and they improve the situation. Particularly in these cases is the proverbial ounce of prevention worth many tons, not pounds, of subsequent trouble and expense.

The third development that I want to discuss—and I am making this whole talk rather sketchy because I believe we can induce a certain amount of very interesting discussion or questions rather than embodying in my main talk what may or may not interest you—is new types of emulsifiable oils. By that I mean oils which will emulsify without the use of alkalies or soaps and which are not sulphonated. There have been several such oils developed in the past year or so and I shall say a few words about them and pass around a few of these samples for your inspection. They are not intended as propaganda. They are not labeled with trade names, so you can safely look at them.

In this type of oil an attempt has been made to overcome some of the disadvantages of sulphonated oils, among which is the presence of free fatty acids which though they are not injurious in their right place may be injurious for certain uses. In the second place, sulphonated oils contain, either because they have to or because the manufacturer or consumer want them, considerable quantities of water which though not harmful sometimes may not be desirable. Sulphonated oils contain a certain percentage of salts that are there due to the method of manufacture and which cannot be entirely removed. These may at times be undesirable. Sulphonated oils under certain conditions may decompose with results that are also undesirable. And in addition to that the process of sulphonation tends to change the nature of the fatty oil that is originally treated so that you have not got castor oil in its original form or olive oil in its original form, or whatever else you may be treating.

In the production of this type of oil an attempt has been made to overcome these objections with, I believe, a very fair degree of success. Essentially, these oils consist of a solution of a practically anhydrous soap in the oil to be emulsified so that in a castor oil product you have castor oil soap dissolved in castor oil, no other soap being present unless it is desired to make a mixture. We have coined the term "solutized," just for convenience, to refer to this solubilized oil, so that this one is marked "Solutized Olive Oil," meaning that it is olive oil which has been rendered water soluble. These products are practically anhydrous, may run from 1 to 3 per cent water, as against the high water concentrations of the sulphonated types of oils.

I shall pass around the samples of solutized castor oil, cottonseed oil and China wood oil (this is just to show the varieties, not that they are of any interest necessarily to the textile trade).

Here is one that is a mixture of olive oil and white mineral oil solutized.

As I have said, besides being practically anhydrous these oils are almost neutral. They contain perhaps from one-tenth to five-tenths of a per cent of free fatty acid so that in an application where fatty acids may be undesirable these oils find great favor.

I may say before you make any practical experiments that these oils are not as readily emulsified in the cold as sulphonated castor oil, for example, but they are emulsified very readily in warm water, so that in any application where the oil is to be removed the emulsification can be accomplished in warm water. One gentleman here at my left has already made the first experiment and put a drop in a glass of drinking water. It does disperse somewhat in the cold water.

You must again be reminded that these oils are not panaceas, that these oils are not applicable everywhere, that they are not intended as substitutes for sulphonated oils. They have been developed for supplementing the existing soluble oils and to be utilized in such places where the present soluble oils do not function properly.

In addition to those oils that I have mentioned we have succeeded in solutizing practically every vegetable, animal, fat, and wax. We have produced solutized Carnauba wax for specifice purposes, stearic acid, tallows, and in fact any fatty material or mixtures of fatty and mineral oils. I believe the last subject discussed will be of particular interest to many of you and you may have a number of questions about that and other parts of my little address. I shall be very glad to accommodate you. (Applause)

Discussion

Chairman Kingsbury: Are there any questions?

Mr. Hadley: I should like to inquire if a rancid castor oil was sulphonated whether the resultant castor oil product would receive an odor and whether the rancidity would develop on application to cotton material?

Mr. Wechsler: I do not believe the sulphonation will improve a rancid castor oil.

Mr. Hadley: In other words if it was rancid to start with it would be rancid after the sulphonation?

Mr. Wechsler: Yes, sir.

Mr. Herrmann: Mr. Wechsler, turkey red oils and monopole oils are frequently used as dye assistants. It may be one of these things that dyers do as a matter of habit in trying to achieve something which is otherwise difficult to obtain. I am just wondering whether your solutized oils might possibly aid in the leveling of colors, say, vat colors, as dyed to rayon. Do you increase the penetration better than the well-known sulphonated oils?

Mr. Wechsler: No, the solutized oils are not dye assistants. They are not as good as the sulphonated oils in this rapid dispersion in water and would not be suitable for that purpose.

One type of oil here I may say is particularly suited as a lubricant for knitting of rayon. The oils have very good lubricating properties and have the property of being easily removed and are particularly suited because of the fact that they are so inert that they have no effect on long standing in contact with the yarn.

Mr. Hadley: Would a rancid castor oil have a tendency to increase the acetyl value of that oil?

Mr. Wechsler: I do not believe so. The acetyl value of castor oil as you know is the highest of any of the known fatty oils. It is in the neighborhood of 150, and since it is a measure of the hydroxyl ion I cannot see how rancidity is going to raise the acetyl value. It, as a rule, is associated with increase in the free fatty acid, although they are not necessarily concomitant. You may have a high fatty acid oil that is not rancid and you may have a rancid oil that is not high in fatty acid, but usually you do get a development of fatty acid at the same time that rancidity develops.

Mr. Hadley: Do you know anything that would be apt to occur in sulphonated castor oil which would raise the acetyl value? Dioxystearin has a tremendously high acetyl value, if I am correctly informed. I wonder if that would occur in a sulphonated castor oil? That would have a value if I am correctly informed as high as 24 or 25.

Mr. Wechsler: You will find if you take an oil like oleic acid that has no hydroxy radical and has a practically zero acetyl value that after sulphonation you do get an acetyl value on the fat separated from that oil due to the formation of these dioxystearins that you refer to. But in the case of castor oil you have a different reaction as I understand it in sulphonation and you do not increase the per cent of hydroxy radicals in sulphonated castor oil, but, if anything, decrease it. So that the tendency is to find a certain acetyl value on olive oil or oleic acid or neatsfoot oil or cottonseed oil after sulphonation which you do not have before sulphonation. But in the case of castor you usually find a slightly lower acetyl value.

Dr. Harold: I have heard that in Europe they have reduced very materially the time of sulphonation, that is, that they have a short process. Do you know of the arrival of that rumored process in America?

Mr. Wechsler: I do not know anything about the time of sulphonation or the process as it is supposed to be used there. I do not know about the products coming over here claiming to have (and some of them do) very interesting properties but I have heard the rumor that they are going to be manufactured in this country, although I do not think they are being manufactured at the present time.

Mr. Winkler: Will any of these solutized products be suitable for practical use in the woolen industry?

Mr. Wechsler: Yes, they are being used now. Several mills have been running for quite a long while with oils of this type as a lubricant. Of course, they are not cheap and do not compete in price with soluble wool oils that are sold for 25 and 30 cents a gallon. So that their application is naturally limited to very fine worsteds, and to high-grade blanket wools.

Chairman Kingsbury: Are there any more questions?

I think, gentlemen, we owe our speakers this evening a rising vote of thanks for their very instructive talks. I have enjoyed them thoroughly myself and I am sure you have, too.

. . . A rising vote of thanks was extended to the speakers of the evening . . .

Chairman Kingsbury: I declare the meeting adjourned.

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Textile Color Card Meeting

The Textile Color Card Association held its Fifteenth Annual Meeting and Luncheon on April 17th at the Hotel Astor. Edward J. Johnson, president, who presided, announced the winners of the three scholarships, founded by the Association during the past year, for the creation of higher appreciation of color by students in the textile schools. The awards were given to Margaret Gray Scadding of Lowell Textile Institute, Richard Kerr Palmer of Philadelphia Textile School and Anna Lanman of the New York Textile High School.

At the morning session the regular routine business was attended to and Mrs. Margaret Hayden Rorke, Secretary and Managing Director, read her annual report, reviewing the outstanding activities and remarkable expansion which had been brought about during the past year.

Richard S. Bach, Director of Industrial Relations of the Metropolitan Museum of Art, presented the main address at the luncheon. His subject was "Color Goes Modern." The players from Japan, under the auspices of the Japanese Theatre Association, provided the feature entertainment in the form of a lyric dance drama, "Kio-Ningyo," accompanied by a native Japanese orchestra.

Cyanamid Expands Further

The American Cyanamid Company, it was announced recently, has merged three more dyestuff manufacturing and importing companies in the acquisition of the Wettersol Dyestuff Corporation, Wetterwald & Pfister Co., Inc., and the Dye Products & Chemical Company, all of New York.

These most recent mergers will swell the number of firms taken over by this company to the number of eleven. The list of those which had already been absorbed is as follows: The May Chemical Works, The Sulphur Dioxide Division of the King Chemical Company, The Textile Chemical Company of Providence, The Crown Chemical Company, The Garfield Aniline Works of New Jersey, Passaic Color Corporation of Passaic, the Beaver Chemical Company of Damascus, Va., and Heller & Merz. The entire personnel of the three most recently acquired firms will join with the Calco Chemical Company, Bound Brook, New Jersey, the Cyanamid Company's large subsidiary which is engaged in the manufacture of intermediates and the sale of these products.

Prof. Mullin Addresses A. C. S. Meeting

Dr. Chas. E. Mullin, Professor of Chemistry, Rayon and Dyeing in the Clemson College (S. C.) Textile School, read a paper on "The Rayon and Synthetic Fiber Industry of America" as part of the general program of the National Meeting of the American Chemical Society in Atlanta, Ga., on April 8. On the following day he presented another paper on "The Relation of Cotton to the Rayons and Synthetic Fibers" before the Division of Chemical Education of the same gathering.

General Dyestuff's Releases

The General Dyestuff Corporation has sent to the trade a card illustrating their new Indo Carbon C L G Conc. on pure silk skeins. The older CL Conc. brand, according to the announcement, was frequently used for this work on account of its fastness to peroxide bleaching but was often considered as too red in shade. The new brand, it is claimed, produces very rich jet shades of black on pure silk.

As the selling agents of the General Aniline Works, the same corporation has offered as a new brand of domestic manufacture Formyl Violet S 4 B A. It is claimed that this product corresponds in all respects with the improved Formyl Violet S 4 B and that it produces from a Glauber's Salt Sulphuric acid bath bright violet shades of very good fastness to washing and fulling. It is recommended for dyeing of ladies' dress goods and all kinds of woolen yarn.

General Dyestuff has also distributed a very attractive booklet entitled "The Dyeing of Acetate Silk." In its twenty-nine pages, the dyeing in the hank of piece as well as of mixed fibres containing acetate silk is described in detail. The brochure should prove a useful aid in the field of color application.

Permutit Booth at the Textile Exposition

The Permutit Company is planning an exhibit of chemical feeding equipment in operation at the Boston Textile Show. This will be a full-sized industrial unit which will demonstrate the method of control by which chemicals are fed simultaneously with and in proportion to the flow of water. One of the other points which they will feature will be the display of various fabrics which have been processed in Permutit conditioned water.

R & H Exhibit In Boston

Cotton bleachers will be interested in the exhibit made by the Roessler & Hasslacher Chemical Company at the International Textile Exposition in Boston. A bleach house will form the nucleus of their exhibit and will feature the adaption of the regular iron kier for bleaching of all kinds of cotton goods. A technical representative of the company will be in attendance to explain the various features of peroxide bleaching.

Oakite Display

Oakite Products, Inc., will display samples of fabrics of finished garments in rayon, combinations of rayon and silk, silk, cotton and wool that has been processed with Oakite materials. These will be arranged to show the improvement obtained with Oakite in boiling-out, bleaching, degumming, dyeing, fulling and soaping operations. There will also be a working model of string washer in operation during the exposition.

AMERICAN DYESTUFF REPORTER

SAMPLE SWATCH QUARTERLY

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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April 28, 1930

SHOWING UP

WHY is it that the expression "showing up" should have come through the years to acquire such a dire, not to say sinister, significance? To "show up" something means to the ordinary man to expose it, or at any rate, to place it in a rather uncomplimentary light. But is this quite fair to two short and averagely respectable English words? Why cannot something be shown up and at the same time appear to advantage?

As a matter of fact, it is well known that this showing up process works in two ways—and in a world given to progress and containing a sizable number of people given to good works, the way is much more apt to be gratifying than the reverse. Once upon a time it was rather fashionable among politicians of a certain type to say, for example, that industry needed to be shown up, the expression not being used in its happiest sense. There has been a good deal showing up of industry in the past ten or twenty years, though not in the manner that some of its critics imagine. The showing up process has been an informative process, and by and large, it has developed the fact that industry in these United States has been well and profitably conducted to the benefit of its participants from the executive down to the office boy.

This new and clearer view of industry has extended first to one branch and then to another; never was a stronger light of publicity thrown on industry as a whole than to-day, and never has industry made a better appearance than at the present. It is not without reason that such a get-together of industry as the textile conclave at Boston this week is called to "show." It is a show; it displays something, it tells something. A welcome opportunity for the making and renewal of acquaintances and friendships and for the development of business in general, it is also something more. Here is an annual occasion for the registering of gains in a highly important field—for the marking of advance in processes and methods. A live industry never stands still; it would not be alive if it did. It may have its ups and downs for it wouldn't be related to human activity if such were not the case. But lessons can be learned from every experience and the net result in a forward-looking industry certainly should be on the right side of the ledger.

So the best of luck to the annual International Textile Exhibition. It is a show promoted by an industry which can effectively meet any "showing up" and can also meet a "show down" in the same spirit.

THE CRYSTAL ANNIVERSARY

WHEN the Textile Color Card Association of the United States gathered for its Fifteenth Annual Meeting to receive the report of progress covering the past year, those whose idea had developed into such a powerful organization must have felt truly rewarded. From a nucleus built around the belief that there might be created a medium which would serve both the manufacturers and distributors of goods in the dissemination of authoritative information on color tendencies has sprung a group whose members number over a thousand, and whose releases are broadcast not only in this country alone but throughout the world.

Last autumn there was formed another such group similar to this in the British Colour Council which took the Textile Color Card Association as its working model. Its arrival was warmly greeted in England and there is a firm conviction that its activities will be a factor in that country fully as great as has been the record here. It is believed that by close co-operation the Council will become of greater and greater assistance to the British dyeing, bleaching and finishing industries, and that confusion in the names of colors, together with uneven production of goods which have but a limited market, will be largely eliminated.

Mrs. Margaret Hayden Rorke, the Managing Director of the Textile Color Card Association, in her annual address stressed the fact that one of the main objectives of the Association has been the building of larger interests in and appreciation and recognition of its services to department stores. She said, "Since we can justly claim being the pioneers of color coordination and the chief exponent of the economic value of color stabilization, it is with a feeling of gratification that we can report that the past year has been a rapidly increasing awakening on the part of retailers to make use of and apply our principles in the merchandising of the 'ensemble.' We issued at great expense our large comprehensive correlation chart. This has received unqualified commendation from the leading retailers and the most appreciative expression of large buying groups." It was also prognosticated that under the promotion of the Association a closer link will be established between the retail trade organizations from the one end and the manufacturing groups on the other. This link should result in happier relationships and a working out of mutual problems relative to color.

Another important step which has been taken since the last meeting is the awarding of three scholarships which the Association founded in the Lowell, Philadelphia, and New York Textile Schools. These scholarships have proved a great stimulus to the student body in each school. The first selection of the recipients was made by the respective institutes last June, the awards being based on the highest rating in color appreciation and application. They carry tuition for the coming year.

A CENSUS OF DRAGONS

COUNTING the noses of the major problems which confront business to-day, Dr. Hugh P. Baker, head of the Trade Association Department of the Chamber of Commerce of the United States, speaking in New York last week, gave a list including over-production, price-cutting, waste and harmful practices and lack of appreciation of the importance of research.

Dr. Baker, in referring to these factors, some of which are positive and some negative, called them "dragons." Thus he gave his hearers to understand that they are very real dangers more or less imminent if not already at their nefarious work. Opinions will differ as to relative importance of the items he enumerated, and in respect to one or two it is possible that the diagnostician has touched on rather contraversial topics. There can be no question, however, as to the advisability of checking waste wherever leaks can be stopped and to the necessity of research work. One of these goals is in the line of common sense saving, the other in that of constructive activity.

To the dyestuff industry research is the *sine qua non* of progress. As an industry it must cultivate it; and for the benefit of the industry as an entirety the results of research must, as far as possible, be for the common good.

Random Thoughts on Research

How Should It Begin?

IN THE midst of all the enthusiastic and inspiring talk about research and its benefits and especially that called fundamental, there is a rather disturbing indefiniteness. It is of the kind that does not speak out in meeting, but haunts the consciousness of one who sits back in the fireside easy chair or the commuter's seat, and tries to think the thing through.

It has been proposed that a very large amount of the so-called fundamental work should be done, and the sales talk to put it over is based on the notion that from this great pool of new knowledge will emerge technically important, and financially valuable results—enough in fact to much more than repay all that will ever be put into the project.

We firmly believe that this would come to pass, but if you try to talk it to more than a very limited enlightened few you will find yourself trying to reason from the entirely unknown (at least to your prospect) to the known, that is—to some familiar type of result that he can understand (if he can). Such a scheme does not lend itself to the convincing of the business man who must carry the financing until such time as the burden can be passed along to the public where it rightfully belongs and will eventually land. There are probably too few executives with the power to spend, who can properly evaluate such an investment with an indefinitely deferred return, to back such a program to the necessary generous extent.

Why not try to sell something more definite which will have a more immediate prospect of some sort of valuable return? Why not reason from the known, or the readily understandable, toward the unknown—and not worry too much about the latter just now?

A suggested program will most easily "adumbrate" the point. Every textile man has some problem of a technical nature on his mind. He wants to get a better finish for some item, a better quality at less cost, a new novelty, or to eliminate some awkward or expensive process. Some of these things may be utterly impossible; others would be possible if we knew more about the underlying principles that are involved; still others are perfectly solvable but require too much time or money from an individual firm. These are concrete things already known, or at least easily comprehended by the executive who may be approached for financial support.

It will be clear to anyone with research experience that such problems will lead almost at once into unknown realms where explanations and new knowledge must be sought. Why not seek first for some indications or results in the form of useful facts or methods or products which will justify the extension of the work on into fields where returns are not so sure, i.e., toward the fundamental and unknown?

Putting it in another way, we shall be led into fundamental work at once, almost as soon as we start research; or, if the quest for the useful should retard this part of the program a little, would that be serious? Anything in the way of tangible results at the start will be a big advantage, not so much for its intrinsic value as that it will inspire confidence in the undertaking as a whole.

Fundamental is the magic word among research enthusiasts but it is quite unknown and *without definite meaning* among many whom we wish to interest in it, and it is not very easy to explain. Therefore, the urge to give attention to the more tangible at first.

There are many mills who are not taking advantage of many already known and useful scientific facts. While we know from practical experience that it may be difficult, it should in theory be easy to apply this knowledge to the work of such mills, to their definite financial advantage and to thus arouse a further interest in science. Does this sound impractical? All right, then how will you interest these fellows in some science that you have not captured yet?

MEN OF MARK
IN THE
DYESTUFF FIELD

WILLIAM EWART MITCHELL

Vice President in Charge of Sales
Ciba Company, Inc.

WILLIAM EWART MITCHELL was born December 10, 1891, in Pawtucket, R. I., whence his family removed during his early years to Boston, where he attended grade and high schools.

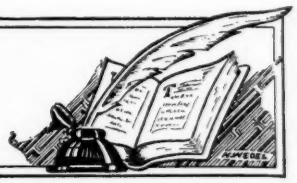
In 1907 Mr. Mitchell found his first employment in the laboratory of Arthur Merritt, a dyestuff distributor of Boston, and while thus occupied also took the night course in chemistry at Franklin Union.

In 1909 he went into the Boston laboratory of the Badishe Company. Here he remained until 1918 when he came to New York to take charge of the application laboratory of Aniline Dyes & Chemicals, Inc., of which concern the Ciba Company, Inc., is the direct successor.

Mr. Mitchell's native business ability, coupled with his long technical experience, earned him steady increase in responsibility. In 1918 he became sales manager of Ciba Company and in February of this year was elected Vice-President in Charge of Sales.

Mr. Mitchell is universally popular and is recognized among his business associates and personal friends as a master of diplomacy. He possesses to a marked degree the unusual but happy faculty of being able to maintain vigorously his own opinions without sacrificing the good will of those who may not share his views.

Technical Notes from Foreign Sources



Vat Dyestuffs and Intermediates

German Patent No. 455,822—*I. G. Farben-Ind. A.-G.*—Alpha-amino-anthraquinones or their derivatives are condensed with formaldehyde or with substances which liberate this, in the presence of acid condensing agents. Stable compounds result, which are not split into their components by water or by dilute acids. A second method of working involves the use of the already known loose, unstable compounds of alpha-amino-anthraquinones with formaldehyde (formed, e. g., by heating the two components together in inert media, or by action of formaldehyde, or of substances liberating it, upon alpha-amino-anthraquinones dissolved in cone, sulphuric acid). The new compounds, as is to be expected, can in part be employed at once as vat dyestuffs, or caused to react further in various usual ways to produce still more complex vat dyestuffs. They are apparently di- or poly-nuclear, are in general very difficultly soluble in organic solvents, and are quite different in all respects from the more loosely composed compounds referred to (see, for example, German Patent No. 123,745). Eleven examples are given.

Vat Dyestuffs from the Naphthols

German Patent No. 461,650—*I. G. Farben-Ind. A.-G.*—The reaction involved is that between chlorinated 1-4-naphthoquinone and the naphthols or their derivatives, carried out in a suitable aqueous or organic solvent or medium, in the heat. The products may be further halogenated if desired. Especially valuable are the products obtained by using members of the Naphthol AS series as the naphthols. The substances obtained can be used either as vat dyestuffs, or as steps in the further building up of more complicated vat dyestuffs. Five examples are given.

Indigoid Vat Dyestuffs

German Patent No. 456,863 (*addition to German Patent No.* 451,411) — *Leopold Cassella & Co.* — The original patent describes the synthesis of fast and bright violet indigoid dyestuffs of the type of 2-Thionaphthene-2-indol Indigo. This present addition employs halogenated hydroxythionaphthenes, whose method of preparation is given. As example, 5-7-dibrom or 5-7-dichlor-alpha-isatine chloride or anilide is condensed with such hydroxythionaphthenes as have the 5-7 or the 5-6-7 positions substituted partly through alkyl groups and partly through halogen—in the 5-7-derivatives, one position through an alkyl, and the other through halogen, while in the 5-6-7-derivatives one or two positions carry an alkyl radical, and the other two or one positions a halogen.

The tones on cotton or wool are in general redder than in the case of the products of the original patent.

Cotton and Acid Dyestuffs

German Patent No. 459,200—(*addition to German Patent No.* 438,324)—*Dr. Paul Karrer, Zurich.*—The original patent proposes to increase the affinity of cotton for acid dyestuffs by esterifying it more or less completely with alkyl or aryl sulphon-chlorides as usual, and then treating it with ammonia, aliphatic or aromatic amines, or hydrazines. The present addition proposes the use also of pyridine, quinoline, or other heterocyclic bases. One example prescribes the following details: cotton partly esterified with p-toluene-sulphon-chloride is refluxed for 15 minutes in pure (presumably means only pyridine alone, of commercial grade, not the very expensive purified, deodorized pyridine?), then squeezed and washed. The temperature should not exceed the boiling-point of the pyridine. The so-treated material shows increased affinity for direct, acid, and basic dyestuffs; the fastness of the dyeings to soaping is also better than in the case of the untreated material.

Naphthol AS Dyeings

Dr. J. F. Stoccker—Mel. Textil-Ber. 10, 628 (1929).—A highly practical paper, taking up in detail all conceivable sources of unsatisfactory results with the Naphthol AS process.

In the preparation of the padding-bath, the purpose of the Turkey-red oil is not only to aid the process of dissolving the naphthol, but, having done this, to help keep the dispersed naphtholate in the dispersed state. Some time after the caustic has been added to the paste of naphthol, water, and oil, an intense yellow color develops, indicating that the formation of the naphtholate has begun. The paste, which contains soft lumps, is stirred up with hot water and steamed until a completely clear solution is formed. This stock-bath is diluted then to the desired concentration by running in cold water, which must be done to the accompaniment of vigorous, steady stirring, to prevent separation, at locally chilled parts of the mixture, of colloidal naphtholate, which, once separated, is very hard to get into solution again—contrary to the case of the crystalline naphthol. The water used must be of high quality—clear, free from mineral oil, and soft. Only baths prepared from "clean" water give uniform results and keep well.

The question of dispersing oils (Turkey-red, etc.) is an important one. Clear naphthol baths can be looked for only when the proportion of oil to naphthol is about 2/1. But the fastness to rubbing of the dyeings (a very serious point in this series) decreases as the amount of oil is increased. Oils recently brought upon the market, which possess a greater dispersive power than Turkey-red oil,

and so can produce the same effect when present in less quantity, are much to be recommended.

Usually, after the bath is properly made up and is being used, no separation of naphtholate takes place. If the bath has to stand unused for a few days, crystalline naphtholate may begin to separate out, but this (crystalline) form readily goes back into solution when the bath is raised to the working-temperature of 40° C.

As to the affinity of cotton for the naphtholate, there seems to be a maximum, dependent upon an ideal temperature, varying with the naphthol used. Most of the dyestuff formed merely clings mechanically to the fiber; some of it, that which is derived from the naphtholate which has actually reacted with the fiber, is actually in combination with the fiber. This portion of the naphtholate (the portion which actually reacts with the fiber) is the truly substantive portion; it gives a determinable value to the substantivity existing between the fiber and the particular naphtholate in question. The point is important, for dyeings from naphthols of high substantivity lose but little of the pigment (in the sense of the insoluble azo-dyestuff) when the goods are soaped after dyeing; and naturally, also, give little trouble in the rubbing test. At high temperatures, the affinity between naphtholate and fiber is below the maximum; as the temperature sinks, it increases to a certain point, after which it again decreases.

Formaldehyde is often added to the bath, but when Turkey-red oil is also used, formaldehyde leads to the separation of colloidal naphtholate, which renders the bath turbid, and, as already mentioned, such a precipitate, in contrast to the crystalline separation, can be gotten back into solution only with great difficulty or not entirely at all.

The affinity of the most-used naphthols is as follows (ascending series)—AS, AS-D, AS-RL, AS-RS, AS-TR, AS-BO, AS-SW, and AS-BR.

Studies in Silk-Weighting

W. Stockhausen—Seide 34, 445 (1929).—The fourth and last paper in the series, earlier ones of which have been noted in these columns. Two topics chiefly are taken up in this present part: the comparative light-fastness of dyeings upon unweighted and upon weighted silk, and the changes in tensile strength of silks variously weighted, under the influence of light, with special attention to the question whether certain dyestuffs exert a protective action upon silk fiber under irradiation.

As to the first point, "for the purpose of gaining more information regarding such relationships, several dyestuffs, selected from the different dyestuff groups, were dyed upon unweighted and upon weighted crepe de Chine, and all the swatches exposed to direct sunlight for a considerable time, without protection under glass. Since it is known that, according to their chemical constitution, almost all dyestuffs take upon weighted silk in a different manner than upon unweighted, the unweighted samples were first dyed with 1% of dyestuff in a 1/50 bath ratio, and then the swatches of weighted silk dyed according to these as samples. With the dyestuffs which give upon weighted material a tone different from that upon unweighted, the weighted samples were dyed to as near the same depth of tone as possible. The exposure of the different, half-covered swatches was carried out under an almost cloudless sky, during the summer; the duration of exposure was for the unfast dyestuffs about 30, and for the more fast ones 45 fading hours, measured according to the Krais Victoria Blue-paper method." It was found that the light-fastness of a particular dyestuff was different in the case of the unweighted and of the weighted goods (a fact already known to practical dyers); that most of the dyestuffs tested were more strongly faded upon the weighted silk; that a few faded to about an equal extent on the two kinds of fabric, and that two, Methylene Blue and Astra Phloxine, were faded more strongly upon the unweighted than upon the weighted silk. No statement generally true, however, could be made regarding the matter.

As to the second point, the change in tensile strength of the weighted silk through irradiation, both weighting and exposure under different conditions, it is less easy to summarize the results. One table gives the results of study of forty-two different kinds of material: breaking-strength and degree of stretching of the unexposed, and the same for the exposed, material. A shorter table gives similar figures for experiments in which the irradiation was not sunlight, but Roentgen rays.

In summary, the author reached the following conclusions:

1—In phosphating of tin-weighted silk, the sodium phosphate is adsorbed by the stannic acid contained in the fiber.

2—During subsequent silicating, a mutual adsorptive exchange takes place between the sodium silicate and a part of the stannic acid present in the fiber; the alkali of the sodium silicate is split off on washing the silicated silk, so that only silicic acid remains in the fiber, in the form, perhaps, of a hydrate.

3—Roentgenographic experiments showed that, during the tin-mordanting of silk, the fibrous structure characteristic of silk-fibroin is in part lost—the fiber partially goes over into an amorphous form. Of the constituents of the weighting accumulated in the fiber, only the stannic acid possesses a crystalline structure; the chemical nature of the stannic acid is not altered by the adsorptively-taken-on phosphori cand silicic acids; the crystalline character of the stannic acid is apparently partially lost in the process.

4—During irradiation, tin- and tin-phosphate-weighted silk is more strongly degraded than is tin-phosphate-silicate-weighted silk, possibly the crystalline structure of the stannic acid plays an important part in the weakening of the fiber.

5—Certain dyestuffs are able to exert a positive influence upon the fiber in reference to light, in both weighted and unweighted silk, especially the former.

6—Silk weighted with phospho-tungstic or with phospho-molybdic acid showed itself, upon exposure, to be more resistant than silk weighted only with sodium phosphate.

7—Through long exposure to Roentgen rays, silk dyed with certain dyestuffs showed a slight increase in tensile strength; only weighted silks gained in solidity through the irradiation.

Printing of Azo Colors

German Patent No. 459,902 (*addition to No.* 446,541) —*I. G. Farben-Ind. A.-C.*—Three methods are proposed for producing azo dyestuffs in the printing: (a) the goods are impregnated with a solution which contains a suitable second component and nitrite, and the salt of a diazotizable amine; (b) as in (a) except that organic acids are also added; (c) the goods are impregnated with a solution containing nitrite, a suitable second component, and a diazotizable amine, the color being developed by printing on an acid paste, preferably containing an organic acid as the acid component.

Five examples are given.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

Experienced Dyestuff and Chemical Salesman offers his services. Has real selling ability and buying acquaintances in Northern New Jersey, covered by him for many years. Address Classified Box No. 599, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

As Sales Manager or Manager of Branch office. Over 20 years' experience in the Dyestuff and Chemical Business. Five years Branch Manager. Conversant with Imported as well as Domestic Dyestuffs, their application and properties. Have traveled here and in Foreign countries as Salesman and Demonstrator. Best of references. Address Classified Box No. 600, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Man, 35 years of age; 5 years Sales Office experience; 12 years Salesman, Dyestuff and allied specialties, desires position with reputable concern in textile field. Address Classified Box No. 601, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Technical Chemist—College graduate; age 32; married; 14 years laboratory and practical dyeing experience; is available for position as chemist or dyer with a progressive concern. Thorough knowledge of scouring, bleaching and dyeing yarns and piece goods; all classes of dyestuffs and application of same, microscopic and chemical analysis, yarns, chemicals, dyestuffs also, etc. Will furnish best of references. Reply to Classified Box No. 602, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

PLUSH DYER

Large finishing plant near New York, specializing in pile fabrics, has an opening for a dyer. Applicant must be thoroughly experienced and competent. Write giving full details to Classified Box No. 603, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

TEXTILE CHEMIST

Prominent piece goods finishing plant in New Jersey has opening for assistant to Chief Chemist. Requirements include first-class training in chemistry and physics. Weave mill experience helpful. Address, giving full history. Classified Box No. 604, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

CHEMIST—Recent graduate, age 23, B. S. (N.Y.U.) M.A. (Columbia U. June, 1929) desires permanent connection with reliable organization affording opportunity with advancement. Available now. Address Classified Box No. 605, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Young Chemist—Colorist, now employed, with 1½ years' laboratory and plant control experience, principally in dyeing and printing acetate rayon, alone and in conjunction with other fibers, desires new connection with opportunity for advancement. Textile School graduate. Address Classified Box No. 606, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

PRINT WORKS COLOR-MIXER

wishes to locate with progressive concern. Am a graduate of Textile School and have had laboratory experience. Also experienced on all classes of colors on rayon, celanese and cotton. Address Classified Box No. 607, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.